# 3D WORLD USER GUIDE

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# *Chapter 1*

# *Introduction*

Basic information regarding 3D World and 3D World plug-ins, including installation instructions and technical support details.

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## Introduction

Thank you for choosing 3D World, the affordable, easy to use alternative to today's complex 3D applications for the Macintosh®. Designed for novices as well as professionals, 3D World provides all the tools you need to create realistic 3D designs, animations and QuickTime® movies.

In addition to a core application suitable for viewing and manipulating existing 3D files, 3D World offers a plug-in architecture that makes it easy to add tools and extend the program's functionality. Plug-ins can be palettes, tools, menu items or idlers and can be loaded as the application is launched or 'hot' loaded while 3D World is running. Information about the plug-ins available is provided in this manual.

Additional rendering options, such as transparent surfaces and interactive constructive solid geometries, are available through supported QuickDraw 3D hardware renderers. Plug-in software renderers from Microspot and third party companies can be accessed by 3D World if they are installed in the Extensions folder. For added convenience, the 3D World product also includes the Librarian utility for cataloging and retrieving frequently used 3D objects, textures, and sounds.

Take a look at the extra items on the CD which are not installed on your hard drive during the installation procedure. Use the sample textures, libraries and 3D files to quickly and easily create 3D documents, view the movie files to see some simple examples of animations created in 3D World, and play the demo movies for a brief explanation of some 3D World features. Demo copies of PhotoFix, MacDraft and the Microspot drivers are included for those who are interested in other Microspot products.

## ◆ Requirements

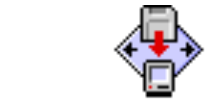
3D World minimally requires:

- Power Macintosh™ with CD drive
- System 7.1.2 or later
- QuickDraw™ 3D 1.0.2 or later (The version of QuickDraw 3D available at release date is included.)
- 16 Mb RAM to install QuickDraw 3D
- Drag & Drop Manager (built into System 7.5 and later)

## ◆ Installation

Before installing 3D World, we recommend that you turn off any virus protection software.

1. Insert the CD into the CD drive and double click on the CD icon on the desktop to display its contents.
2. Double-click on the 3D World Installer icon:




Follow the instructions in the dialogs that display to install the complete 3D World application, plug-ins, Librarian application and QuickDraw 3D software. After installation you will need to restart your Mac.

The QuickDraw 3D software will be installed in the appropriate places on your hard drive.The Librarian application and its associated files will be placed in a folder called Librarian, and the remaining items will be placed in a folder called 3D World 3.1, on your hard drive.

## ◆ Enabling 3D World

To enable your copy of 3D World, run the Register Now utility and follow the instructions that display. Enter your name, company name (if applicable) and serial number in the dialog and click OK. You can then enable further Microspot products if you wish. If you do not enable the product it will run in demo mode and you will not be able to save, print or export data.

If you do not enable the product using the Register Now utility, each time you launch the application you will be given the opportunity to enable it.

## ◆ Plug-ins

3D World's plug-in architecture allows plug-ins to be used to add functionality to the application in many different ways. Plug-ins may be available in more than one category:

**Import Plug-ins:** Plug-in functions accessed via the Import submenu in the File menu.

| | | |
|---|---|---|
| DXF | MacInteriors | VRML 1.0 Format |
| Extrude Bitmap | Relief | |

**Export Plug-ins:** Plug-in functions accessed via the Export submenu in the File menu.

| | | |
|---|---|---|
| 3D Movie | DXF File | VRML 1.0 Format |
| 3DMF Text | Picture | |

**Menu Plug-ins:** Plug-in functions accessed via the Plug-in menu in the application menu bar.

| | | |
|---|---|---|
| 3D Controller | Construct Idler | Random Color |
| Add Backface Style | Convert To Mesh | Remove Styles |
| Add UV | Counter | Save Textures |
| Animate Camera | Delete Attributes | Scale Object |
| Animate Color | Draw Direct | Size Window |
| Animate Textures | Earthquake | Skin |

| | | |
|---|---|---|
| Anti-Alias | Enable Tinted Textures | Smooth |
| Array Duplicate | Floors | Speed Cull |
| Auto Save | Gravity | Spin |
| Bomb | Interactive | Surface Area |
| Ceilings | Make Wireframe | Timer |
| Color | Material | To Interactive |
| Compress Textures | Rain | Turbocharge |

**Plug-in Palettes:** Palettes provide a range of options for a specific feature. Display a palette by selecting its name from the Palettes menu.

| | | |
|---|---|---|
| 3D Controller | Cursor Options | Picker |
| Alignment | Find | RAM |
| Animation Player | Fog | Renderer Options |
| Animation Tweener | Gradient | Section |
| Axis | Group Special | Subdivision |
| Bevel | Layers | Textures |
| Camera | Libraries | Tripod |
| Color Palette | Lights | Windows and Doors |
| Construct | NaviCam | |
| CSG | Nudge | |

**Idler Plug-ins:** Run constantly once loaded.

| | | |
|---|---|---|
| Draw Direct Idler | PhotoLink | Status |

**Plug-in Geometries:** Plug-in tools to create shapes. Accessed from the Tools Palette.

| | | |
|---|---|---|
| 3D Text | Lathe | Regular Polygon |
| 4 Walls | Light String | Relief |
| Cone | Math Graph | Sound Marker |
| Cube | Mountain | Sphere |
| Cylinder | Mountains | Spot Lights |
| Dimension | Pie Chart | Text Marker |
| Furnishings | Pipes | Torus |
| Gears | Point Lights | Walls |

| | | |
|---|---|---|
| Irregular Polygon | Pyramid | Windows and Doors |

**Plug-in Modifiers:** Plug-in tools to modify objects. Accessed from the Tools Palette.

| | | |
|---|---|---|
| 3D Paint | Edit Path | Scale Object |
| Add UV | Edit Vertex | Shear |
| Animate Color | Gravity | Skin |
| Animate Object | Internet | Spin |
| Animate Textures | Light Director | Sun Direction |
| Bomb | Make Wireframe | Take Picture |
| Color | Material | Teleport |
| Construct | Orbit | Triangulate |
| Delete Attributes | Pencil | VR |
| Distance | Print | Walkthrough |
| Edit NURB | Random Color | |

**Plug-in Renderers:** Plug-in QuickDraw 3D renderers are accessed through the Renderer Options palette. The Microspot Renderer is not included in 3D World, but it is available seperately from Microspot.

## ◆ Installing Plug-ins

The 3D World plug-in architecture makes it easy to add tools to‘custom build’ the application and extend the program’s functionality. Plug-ins can be palettes, tools, menu items or idlers.

Plug-ins can be loaded when the application starts up by placing them in the Plug-ins folder inside the 3D World 3.1 Folder. Plug-ins can also be ‘hot’ loaded as needed, individually or in groups, while the application is running.

To make the best use of available memory it is recommended that the plug-ins always used with 3D World are placed in the Plug-ins folder and loaded when the application is launched. Additional plug-ins can then be loaded as required while the application is running.

When Import, Export, Idler, Menu Command and Palette plug-ins are loaded they appear in the appropriate locations in the application menus. Palettes loaded when 3D World is launched will be opened if they were open last time the application was closed. Palettes loaded when the

application is running will open automatically. Plug-in Geometries and Modifiers will be added to the Tools palette, which grows dynamically to accommodate them. *See Configuring The Tools Palette on page F-2 for more details.*

Brief information about 3D World plug-ins is available via the Apple Menu. Select About Plug-ins from the Apple Menu and a pop-up menu lists the installed plug-ins. Select the name of a plug-in to display a dialog containing information about that plug-in.

### Loading Plug-ins when 3D World is Launched

Place any plug-ins to be loaded when 3D World is launched inside the Plug-ins folder. Plug-ins can be grouped inside folders and the folders placed in the plug-ins folder if required. This allows you to group plug-ins together in folders as per your requirements and load or unload them as a group by dragging the folder in or out of the Plug-ins folder.

**Note:** Hold down the Shift key when launching 3D World to stop all plug-ins from loading.

**Note:** Plug-in renderers from Microspot or third party companies can be accessed by 3D World if they are installed in the Extensions folder.

### Loading Plug-ins while 3D World is Running

Plug-ins not loaded when 3D World is launched can be loaded while the application is running, in the following ways:

- Double click on a plug-in icon in the Finder.
- Drag a plug-in icon into the 3D World Tools palette.
- Drag a plug-in icon into the main 3D World document window.
- Drag a folder containing plug-ins into the Tools palette. All the plug-ins in the folder will be loaded.
- Drag a folder containing plug-ins into the main 3D World window. All the plug-ins in the folder will be loaded.

**Note**: When a plug-in, for example the Cube tool, is dragged and dropped into the Tools palette or document window, a cube is not added to the document, the Cube tool is just added to the Tools palette.

## ◆ Working Efficiently

If your computer has over 32 Mb of memory, you may want to increase the amount of RAM allocated to both 3D World and Librarian by 1024K (1Mb). This will allow you to drag and drop large sounds, textures, and background pictures into your documents.

**Note:** Apple's QuickDraw 3D uses available free system memory to perform its functions. Therefore, you will need at least 1 Mb of free memory after 3D World has been launched. To find out how much memory is available, click on the desktop, pull down the Apple menu and select About This Macintosh. The largest unused block section of this dialog represents the amount of free memory.

## ◆ Help

Balloon Help is available for menu items. Select Show Balloons in the Help Menu, and move the cursor over items in the 3D World menus to display balloons containing help messages. Select Hide Balloons if you do not wish the help information to display.

If you are using ATI QuickDraw 3D Accelerator Hardware, see the following section for help dealing with any problems.

### 3D World Online Manual

The 3D World online manual is included on the 3D World CD in pdf format. It will be placed in the 3D World 3.1 folder during the installation process. To access the online manual, launch 3D World and select 3D World Online Manual from the help menu. A table of contents will display allowing you to easily navigate through the pdf documents making up the complete manual.

## ◆ ATI QuickDraw 3D Accelerator Hardware

Many of the most recent Macintosh computers include ATI QuickDraw 3D accelerator hardware chips on the computer's motherboard. The ATI QuickDraw 3D Acceleration hardware can also be purchased in the form of a PCI card to use in a PCI Macintosh computer. These ATI hardware products include XClaim 3D, XClaim VR, and Rage Pro.

### Troubleshooting

#### QuickDraw 3D hardware acceleration stops due to insufficient VRAM

*The ATI QuickDraw 3D accelerator hardware also runs the video, and the hardware's capabilities are determined by the amount of VRAM available. If the hardware runs out of VRAM, QuickDraw 3D hardware acceleration will stop working and QuickDraw 3D will revert automatically to software rendering.*

To increase the amount of VRAM available for QuickDraw 3D acceleration try the following:

- Reduce the size of the largest 3D World QuickDraw 3D window. If you are working with multiple windows open, the amount of VRAM used is determined by the largest window, but smaller windows may still be accelerated.
- Reduce the monitor color depth to thousands of colors.
- Reduce the monitor resolution towards 640 x 480.
- Install more VRAM

#### Textures do not display

*If many textures are used in a document, there may not enough VRAM to store them. In this case the textures will not be displayed when using hardware acceleration.*

Try the following solutions:

- Increase the texture compression setting in the ATI control panel.
- Increase the amount of VRAM available using one of the methods listed above.
- Turn off hardware acceleration in the Renderer Options palette. Software rendering uses real RAM to hold the textures.

#### Transparencies do not display

*Transparency is a function of hardware acceleration and will not be seen if hardware acceleration is not running*.

Try the following solutions:

- Check that hardware acceleration is turned on in the Renderer Options palette.
- Increase the amount of VRAM available using one of the methods listed above.

## Technical Support

You must register your product in order to receive technical support, as well as upgrade and new product information. In North America, South America and the Far East, please contact:

Microspot USA, Inc.
1756 Costa del Sol
Boca Raton, FL 33432
USA

Technical Support: (561) 395-9704; International: + 1-561-395+9704
FAX: (561) 395-9941; International: + 1-561-395-9941

Email: support@microspot.com
Web Pages: www.microspot.com

In Europe and other parts of the world, please contact:

Microspot Limited
Concorde House
10-12 London Road
Maidstone
Kent
ME16 8QA
England

Phone: 01622-687771; International: + 44-1622-687771
FAX: 01622-690801; International: + 44-1622-690801

Email: support@microspot.co.uk
Web Pages: www.microspot.co.uk

# Chapter 2

# Tutorial

A brief introduction to some of 3D World's features and tools.

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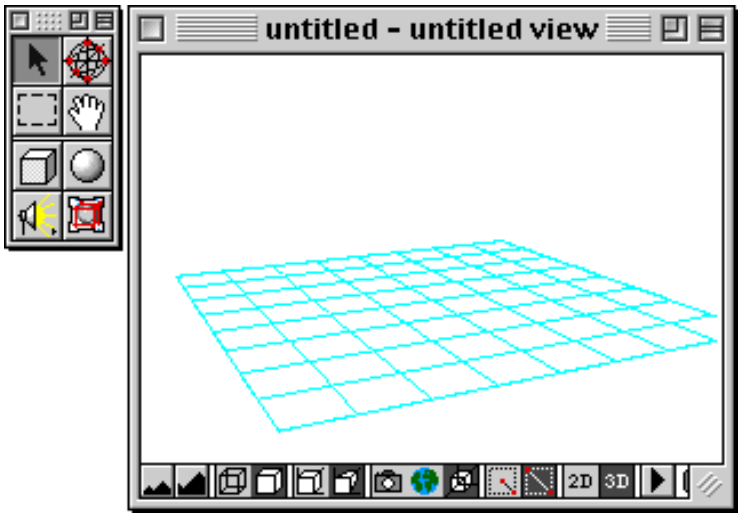
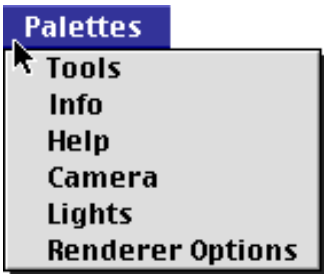
## ◆ Launch 3D World

This tutorial uses the Camera, Lights and Renderer Options plug-in palettes and the Cube, Point Light, Sphere and Spot Light plug-in geometries. If you have these plug-ins, ensure that they are placed in the Plug-ins folder inside the 3D World folder before you launch the application.

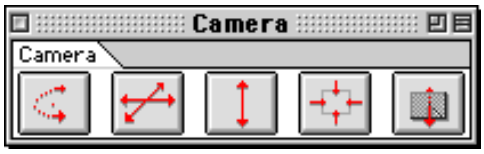
Open the 3D World folder and double-click on the 3D World application icon. A new, untitled document will open, and the Tools palette will be displayed at the left side of the document window:



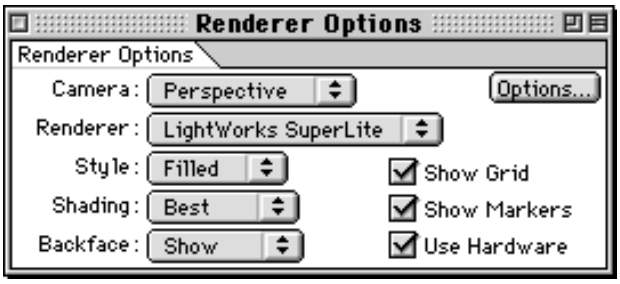

To display the Camera Palette, which allows you to control the camera you are using to view the document, select Camera from the Palettes menu:



The Camera palette will display:

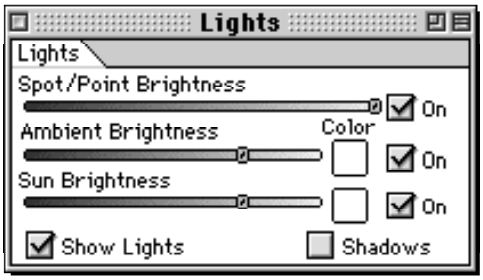



Open the Renderer Options palette by selecting its name from the Palettes menu:

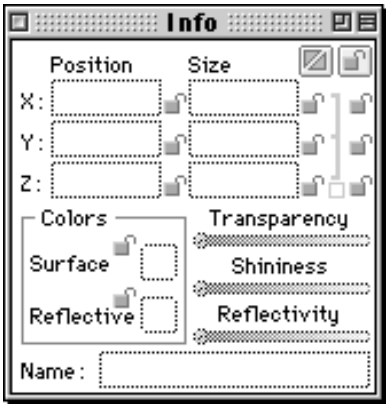



Do not make any changes at this time, unless you are using a 3D accelerator card. If so, make sure the Use Hardware checkbox is checked on.

Select Lights from the Palettes menu to display the Lights Palette, which allows you to control the lighting in your document. Do not make any changes to the palette at this time:



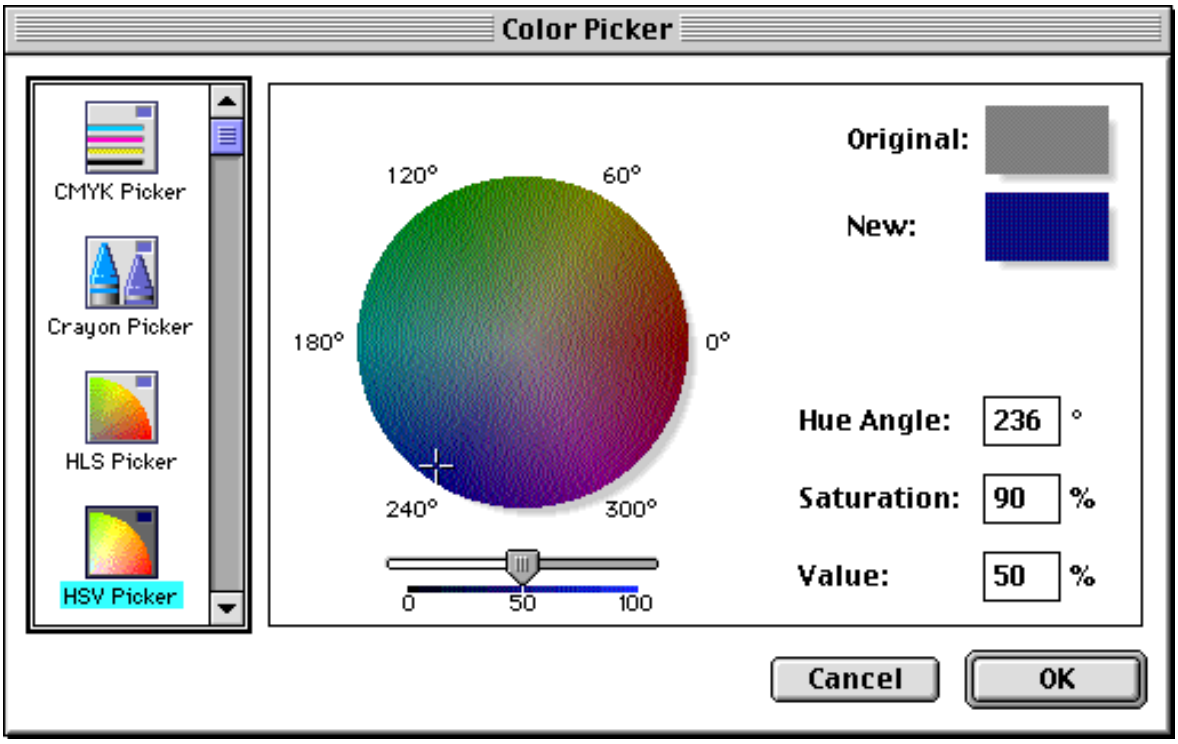

To open the Info palette, choose Info from the Palettes menu. The Info Palette contains information about the currently selected object or group of objects, and allows you to make changes to it. Since no object is selected, the options in the Info Palette are grayed out and you cannot make any changes:




You will see the Window toolbar at the bottom of the document window. This palette allows you to set characteristics of the view for the current window. Do not make any changes to the Window toolbar at this time.

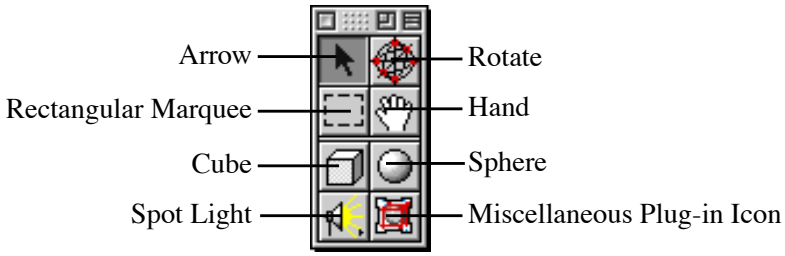
## ◆ Changing the Default Color

Click on the Default Color button at the bottom of the Window Toolbar. When the Color Picker displays, select a different color by clicking on the color circle:

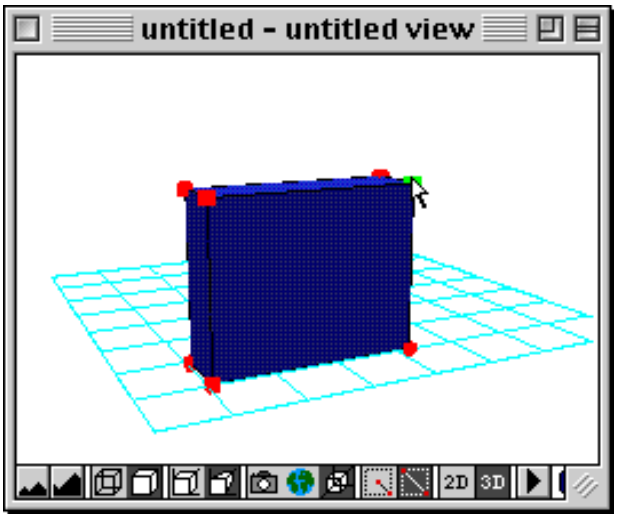



Click OK. The new Default Color will be shown at the bottom of the Window Toolbar, and will be used to draw any new objects.

## ◆ Drawing an Object



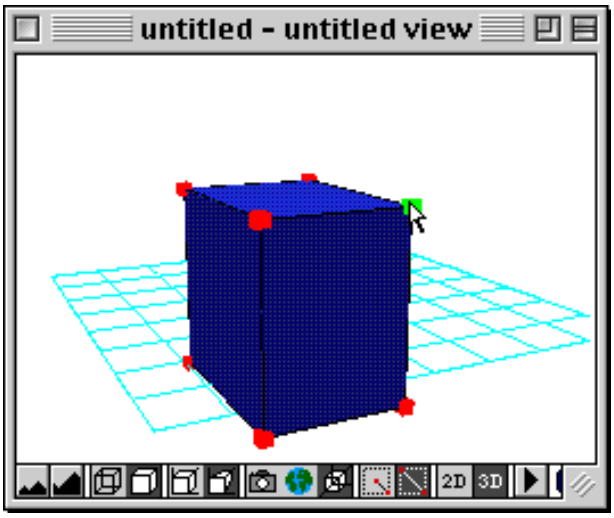

Go to the Tools Palette and click on the Cubes tool. Move the mouse into the center of the grid, click, and drag up and to the right. You will have drawn a solid rectangular box:



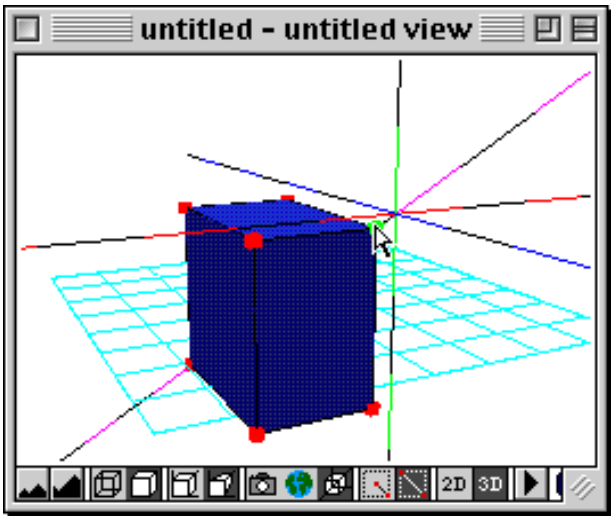

## ◆ Resizing an Object

The box you have just drawn will have red handles at each corner, which you will use to resize it. Place the cursor over one of the handles (the arrow will become white). Click and drag to make the object taller or wider, depending how you move the mouse.

Next, drag one of the handles while holding down the Control key. When you move the mouse up and down the screen, the object will get thicker and thinner. Use these controls until you are familiar with the action of the Control key:

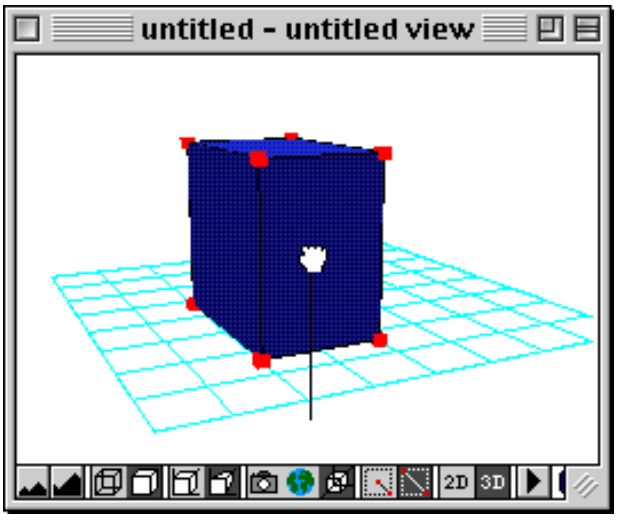



Resizing can also be done in a controlled way. As you drag an object's handle, hold down the Shift key. Four lines, called constrainer lines, will appear on the screen. The red, green and blue lines allow you to vary one dimension of the object, while the other two remain constant. The pink line allows you to increase or decrease the size of the object while keeping its proportions constant. Test the effect of dragging along all lines:

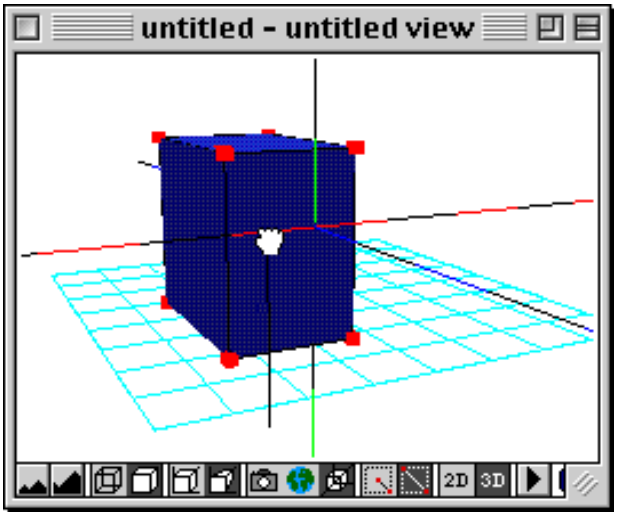


## ◆ Moving an Object

Click on the center of the object and drag it around on the screen. Hold down the Control key as you drag to move the object closer and further away:



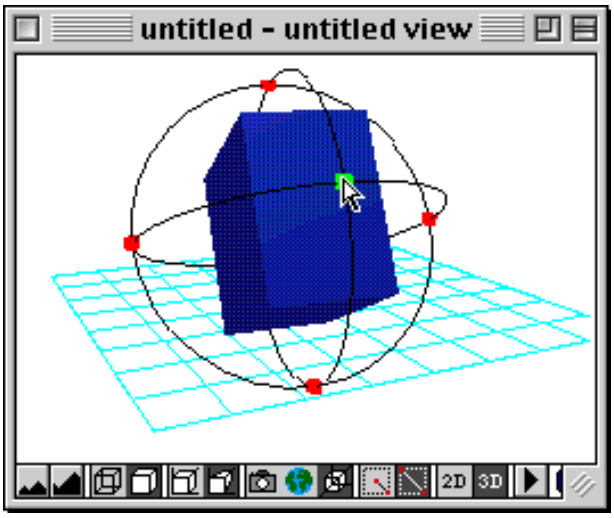

If you hold down the Shift key while moving the object, three constrainer lines will display. You can drag the object along these lines to move it along the three axes:



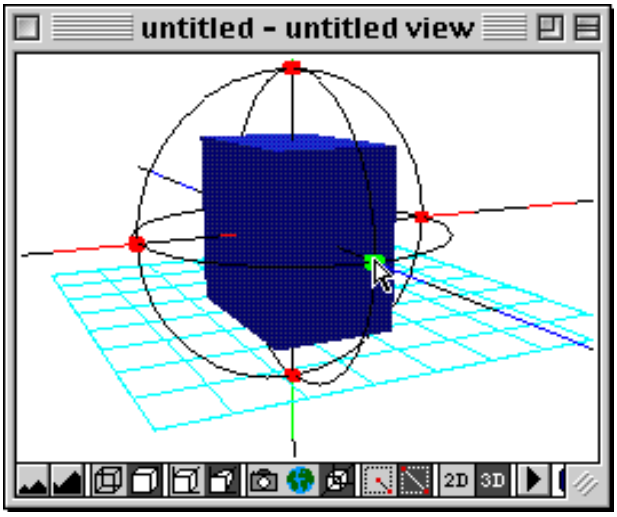
You can also use the directional arrow keys on your keyboard to move objects. Select the object with the Arrow tool, then press an arrow key to move the object up, down, left or right. If you hold an arrow key down, the object's movement will accelerate. To move the object closer and further away, hold down the Control key while using the up and down arrow keys.

## ◆ Rotating an Object

Click on the Rotate tool or type R on the keyboard to select the Rotate tool. When you select this tool and click on the object, it will be surrounded by a bounding sphere with handles at the points where the bounding lines intersect. As before, when you place the cursor over one of these handles, the arrow will change to white. Click and drag to rotate the object:



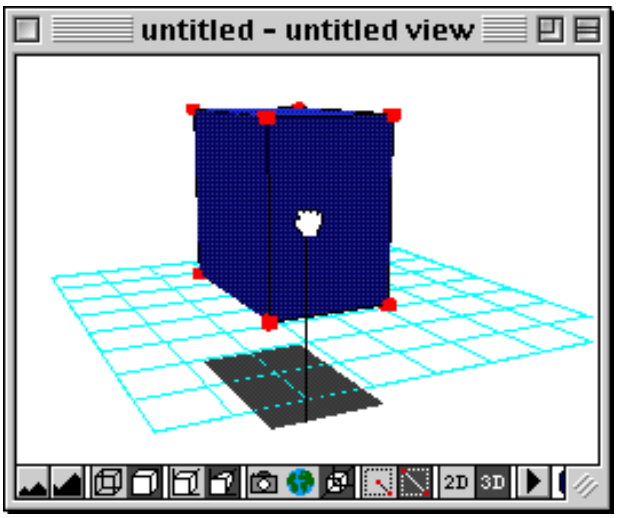

Hold down the Shift key as you rotate the object to display constraining lines with which the object will automatically align. The object will now rotate in 90° steps. Let go of the mouse and while continuing to hold down the Shift key, press one of the directional arrow keys. The object will rotate now in 45° steps. Releasing the Shift key will allow you to rotate the object in 1° steps. If you hold an arrow key down, the rotation will speed up. You can also use the Rotate tool to move the object by clicking on it and dragging like you did earlier with the Arrow tool:




## ◆ Shadows

You probably noticed that when you dragged the object, a perpendicular line appeared from the object to the grid below. The purpose of this line is to let you know where the object is positioned relative to the grid.

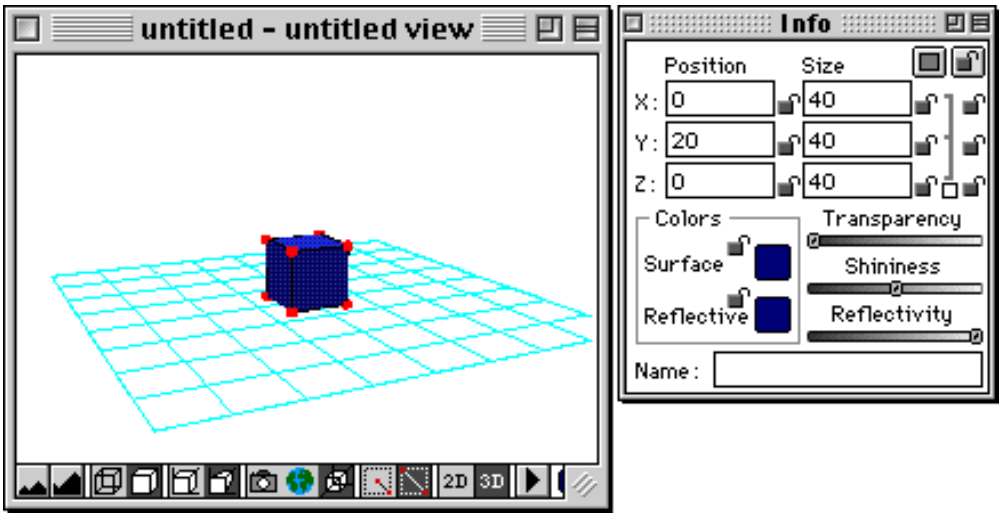
You may also want to open the Lights Palette and click on the shadows checkbox. Doing so will show you a projection of the object's shape on the grid, and help you to gauge the position of the object relative to the grid:



## The Info Palette

Select the object and look at the Info Palette. The position of the object and its size will be displayed. The default unit of measurement is set at inches or millimeters according to the system you are running. Type zero in each of the X,Y and Z Position entry boxes and press Enter. The object will move to the center of the grid.

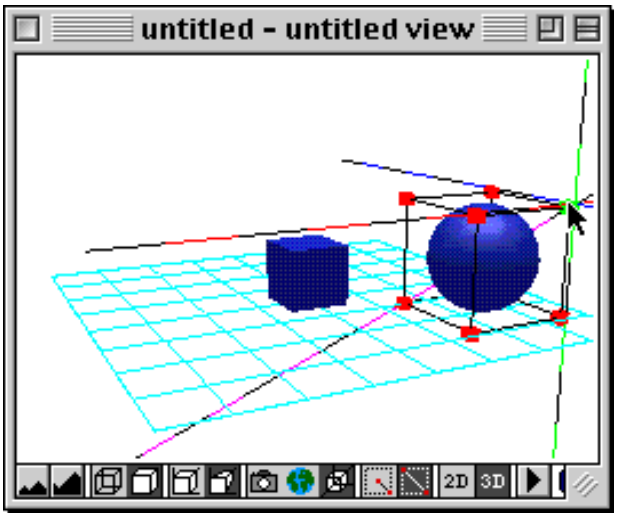
Enter 40 (inches) or 1000 (mm) in each of the Size entry boxes. When you press Enter, the box will become a cube. Now enter half the length of the edge of the cube, 20 (inches) or 500 (mm), into the Y Position entry box. When you press Enter, the cube will move so that it is resting exactly on top of the grid:




Note that you cannot obtain transparency on screen unless you have a QuickDraw 3D accelerator card fitted in your machine. However, if you apply transparency to an object and subsequently transfer the object to a machine with the necessary hardware, the transparency will become apparent.

## Add a Sphere

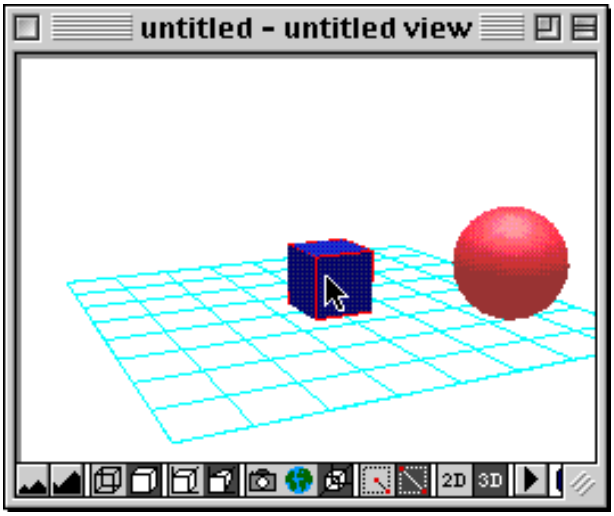
Select the Sphere tool and click on the grid and to the right of the rectangle. Drag the Sphere tool up and to the right while holding down the Shift key to constrain the object to a perfect sphere. If you want to delete the sphere and draw it again, click on it and press the Delete key, or choose Cut from the Edit menu, then start over:




## Change the Color of an Object

With the sphere selected, click on the Default Color button at the bottom of the Window Toolbar. When the Color Picker displays, select a different color. Click OK and the new color will be applied to the sphere and will display on the Default Color button.

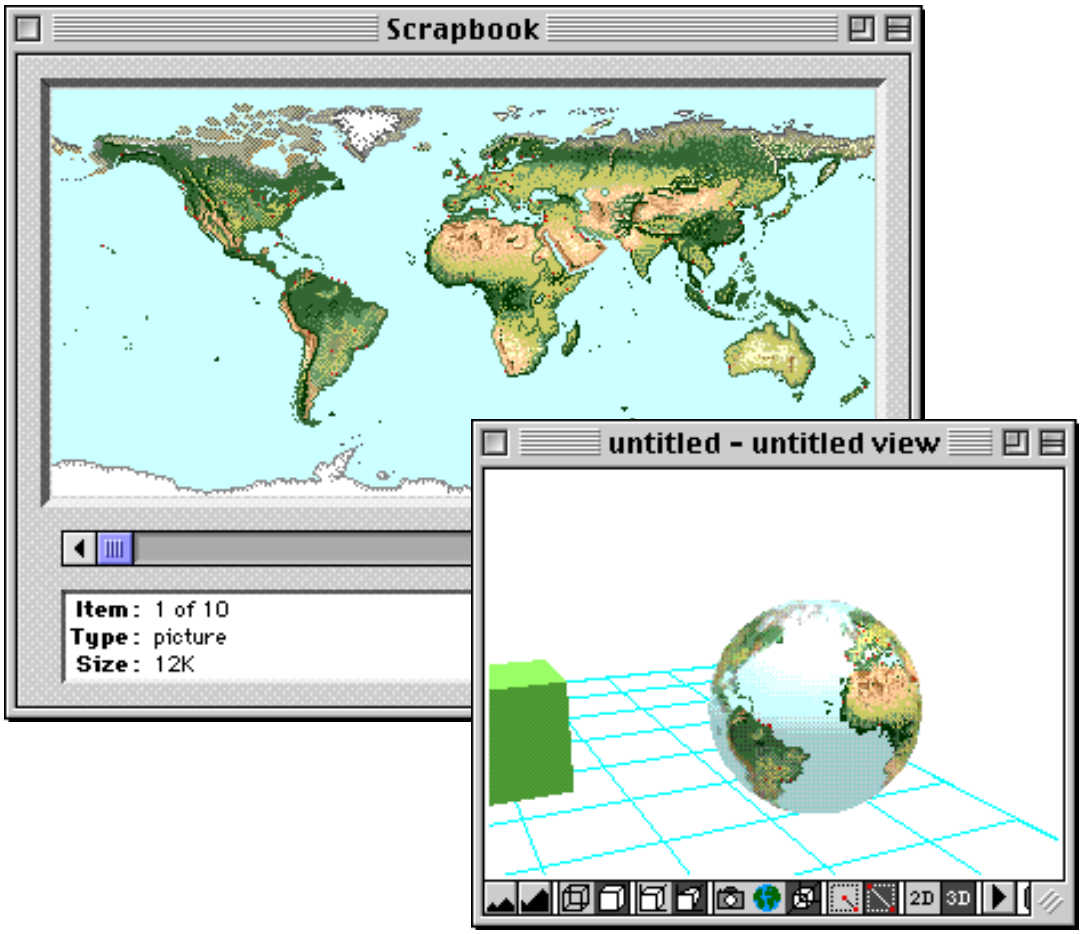
If you choose a new color without first selecting an object, you can drag the color onto the object later. Click anywhere in the window to deselect the objects, then click on the Color tool again. Use the Color Picker to select a new color, then click OK. Hold the mouse down on the Color tool, then drag the color onto the rectangular object. The object will be highlighted until you release the mouse and update the object with the new color:




To draw more complex shapes, refer to the information for each plug-in geometry as described in *Appendix G — Plug-in Geometries on page G-1*.

## ◆ Texture Mapping

Select the Scrapbook from Apple menu items and scroll to the map of the world. Click on the map, then drag it to the sphere in your 3D World document. When the sphere is highlighted, release the mouse to apply the texture:




See *Textures on page D-99* for information about manipulating textures on objects.

## ◆ Add Sounds

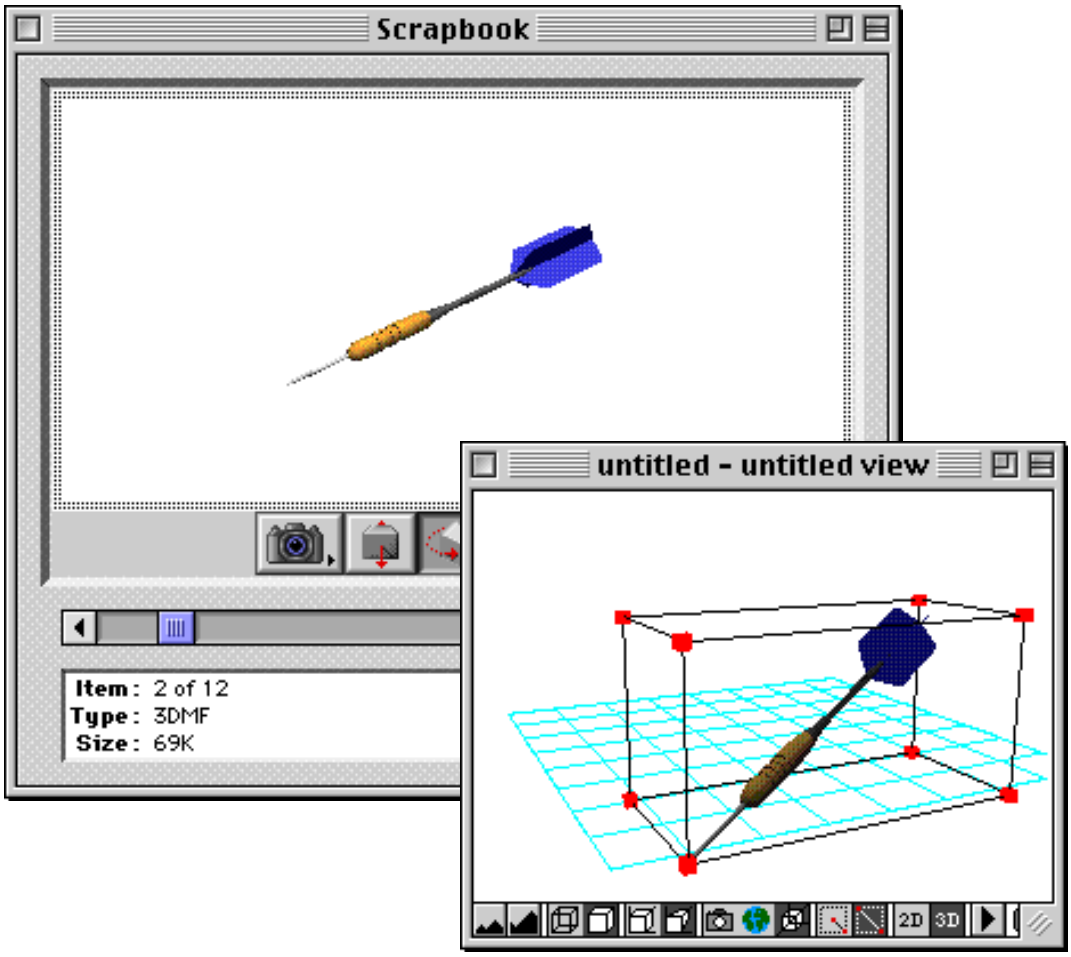
Go back into the Scrapbook and scroll until you find a sound.

Click on the sound, then drag it onto an object in your 3D World document. Click on the object to play the sound. Note that you can drag different sounds onto different objects in the same document and play each one. To stop a sound from playing, press (.) key while holding down the Command key.

## ◆ Add 3D Objects

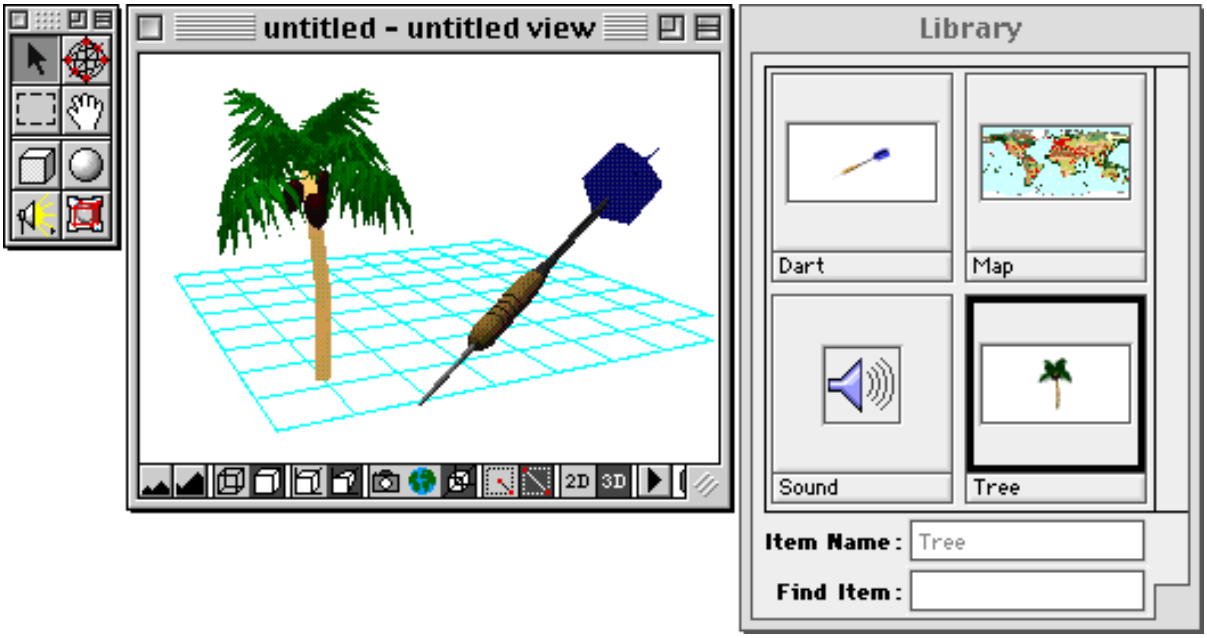
You can also drag 3D objects you have stored in the Scrapbook to a 3D World document. Locate a 3D object in the Scrapbook, click on the dotted gray frame around the Scrapbook win-

dow, and drag the cursor over the 3D World document window. Release the mouse button to drop the object into the document. Once placed in the document, you can further manipulate the object or change its size. When resizing a 3D object, make sure to hold down the Shift key and drag one of its handles along the pink line to retain its proportions:




## ◆ Librarian

The Librarian application allows you to create an unlimited number of libraries in which you can store colors, textures, sounds and 3D objects. These items can also be dragged into your documents. Library items may be searched for by name:

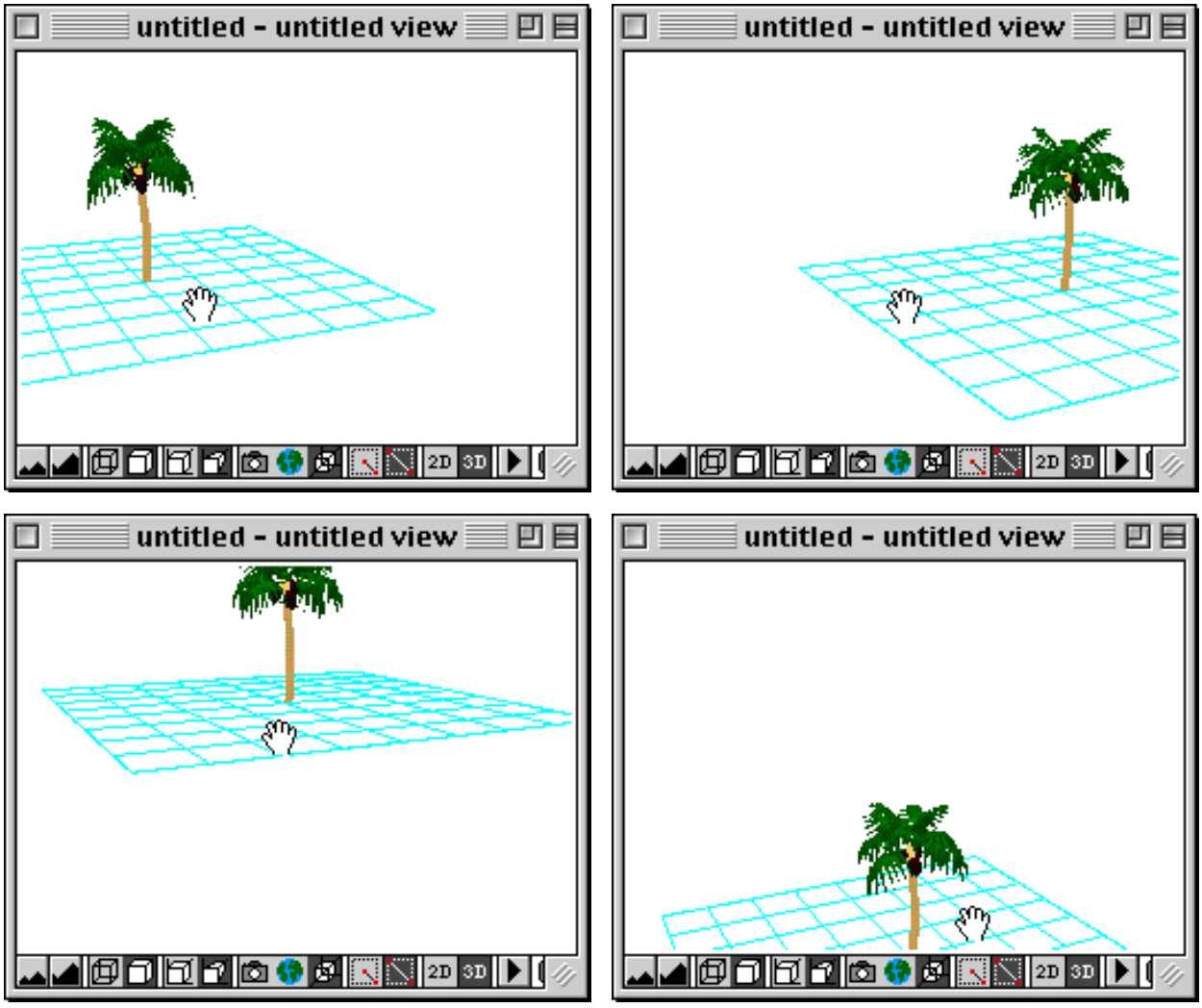



## ◆ Changing Views

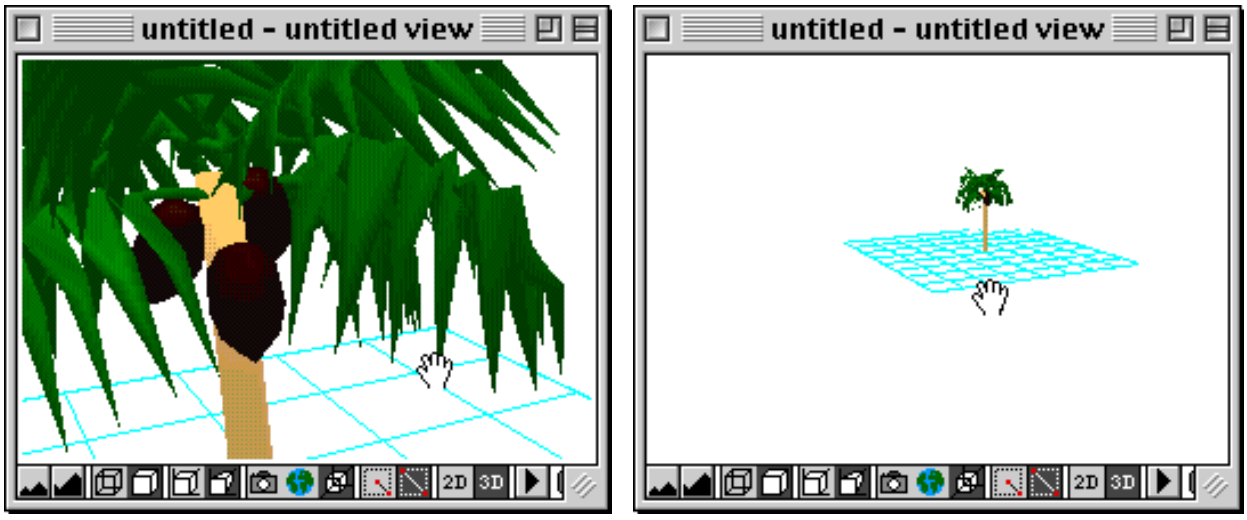
To change your view of objects, you can move the grid, use the Window Toolbar or the Camera Palette.

### Dragging The Grid

Select the Arrow tool and click and drag anywhere on the grid. You can drag it from side to side, up and down:

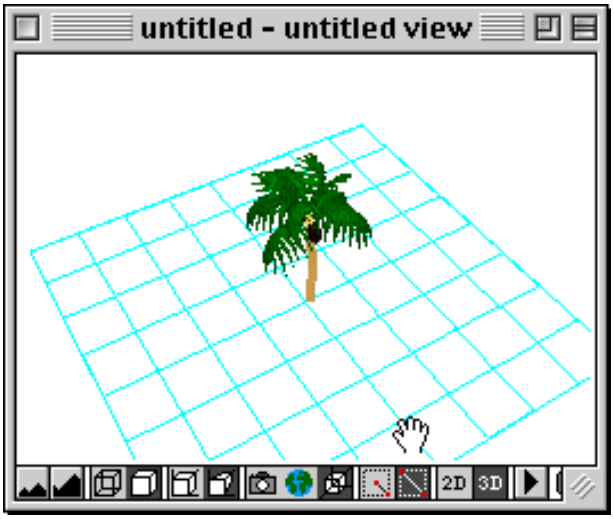

untitled - untitled view
2D
3D
untitled - untitled view
2D
3D
untitled - untitled view
2D
3D
untitled - untitled view
2D
3D

If you hold down the Control key, you can also move the grid towards or away from you:



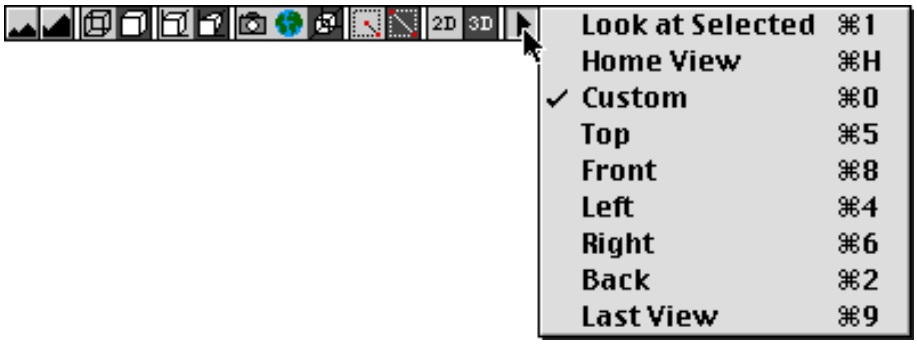

**Rotating The Grid**

Select the Rotate tool and hold down the Shift key. Click and drag on the front of the grid. As you move the mouse from side to side, the grid will rotate around its center point. If you release the Shift key, you can tilt the grid towards or away from you. Take time to experiment with these controls until they become familiar:



### Using the Window Toolbar

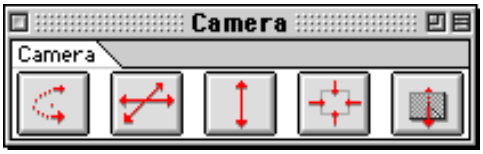
Click on the black arrow in the Window Toolbar to display the View popup menu:




The popup menu lists your view options, which represent different camera positions. Select a several different view options to see how they change your view of objects in the document.

### Cameras

Use the controls in the Camera palette to change your view. From left to right, you can Tilt/Turn; Step/Crab; change the Height; Zoom in and out; and use the Clipping Planes:

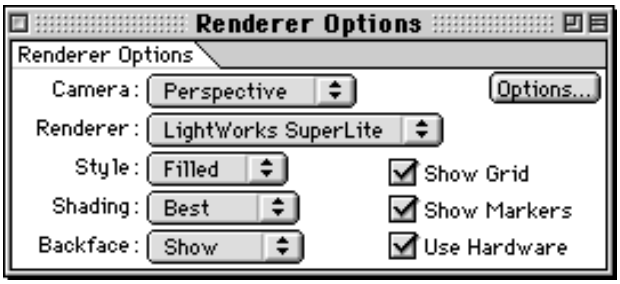



To manipulate these camera controls, click on an icon and drag while watching the window to see the effect that you are producing. *See Camera on page D-30 for more details.*

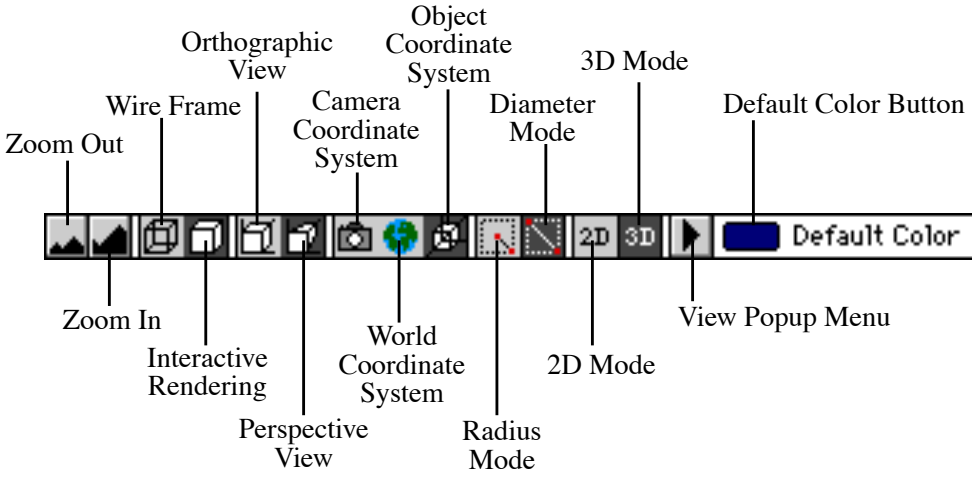
3D World allows you to have more than one window open at a time, with a different view in each window. Select New Window from the View menu to display a new window with an identical view to the original. Use the View popup menu in the Window Toolbar to change the view, then drag the new window to one side and resize both windows so you can see them at the same time. As you manipulate objects in the first window, you can see how the objects change in the second window. When you have finished, close the second window.

## Renderer Options

Use the camera popup menu in the Renderer Options palette to change the view from Perspective to Orthographic. Also try the different renderer options. Click on the checkboxes to see the effects they have on the grid, text/sound markers, and the QuickDraw 3D accelerator card (if you have one). Return the settings to their default values:




## Window Controls




Try the options in the Window toolbar:

- **Zoom Out:** Use to widen the focus of the camera's view and make objects appear to be farther away.
- **Zoom In:** Use to narrow the focus of the camera's view and make objects appear to be closer.
- **Wire Frame:** Select to view objects in wire frame mode.
- **Solid Fill:** When selected, objects are displayed with filled surfaces.
- **Orthographic:** Select to see an orthogonal view of the document rather than a perspective view. In an orthogonal view, all parallel lines display as parallel.
- **Perspective:** Select to see a perspective view of the document rather than an orthogonal view. In a perspective view, parallel lines converge. If extended, they would converge at a point (the vanishing point).
- **Coordinate Systems:** Select the Camera, World or Object icon to specify a coordinate system. The system you choose will affect the way new objects are drawn and existing objects are manipulated.

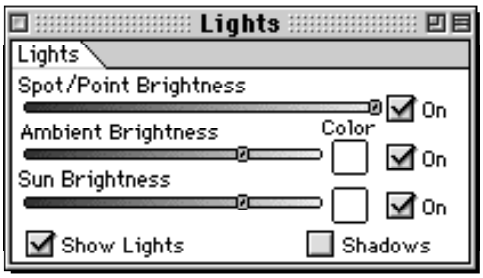
  **Camera Coordinates:** When this option is selected, the X, Y and Z axes relate to the direction and angle of the camera.

  **World Coordinates:** When this option is chosen, the X, Y and Z axes relate to the World Coordinates and are the same as the grid axes.

  **Object Coordinates:** This is the default option. When the Object Coordinates option is chosen, the X, Y and Z axes relate to the orientation of a selected object.
- **Radius:** If selected, objects are drawn from a central point.
- **Diameter:** This is the default mode. When selected, objects are drawn from the point where you initially placed the cursor and began to draw.
- **2D:** If selected, objects can only be drawn in 2D.
- **3D:** This is the default mode which allows you to draw objects in 3D.
- **View:** Use the View popup menu to select a different view, including any that you have saved.
- **Default Color:** The color displayed in the color block at the bottom right of the window toolbar is the currently selected color. Any new items created (except lights and markers) will automatically be this color, even if you are working in wire frame mode.

## ◆ Lighting

In the Lights palette, use the two shorter slider controls to adjust ambient light and sun brightness. Turn these options off and on using the check boxes to the right of the sliders. You can also change the color of the light emitted from these sources by dragging a color from the Default Color button onto the Color boxes, or by clicking on a color box and selecting a new color from the Color Picker:

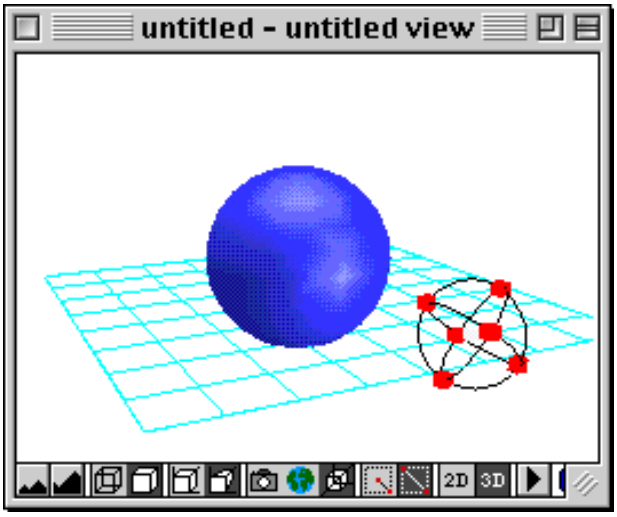



### Point Lights

The slider labeled Spot/Point brightness will affect only the lights that you place in the document. To place a light in a document, go to the Tools Palette and click on the Spot Light tool. Hold down the mouse button to see the any other tools stacked under the Spot Light tool:

Select the Point Light option, move the cursor back into the document window and click to place the light, which will be represented by a light marker and surrounded by a bounding sphere. Make sure you have the Best Shading option selected in the Renderer Options Shading popup menu. Also make sure the Info Palette is open.

Place the cursor over the light marker and drag it around to see how it affects the shading of the objects in the window:

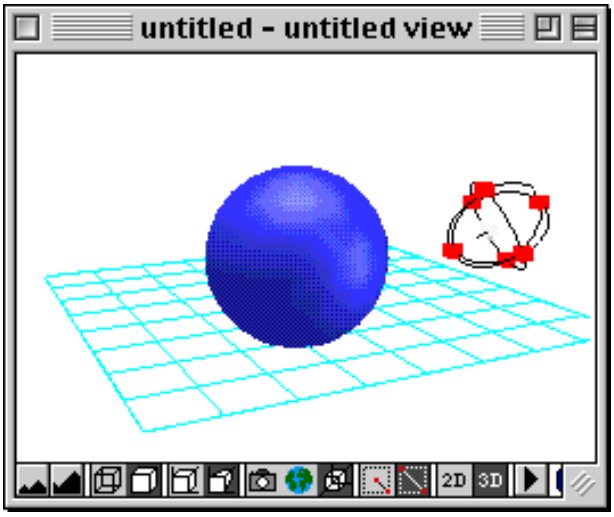



Use the Info Palette to adjust the brightness of the light. You can also change the color of the light by dragging from the Color tool over the Surface box in the Colors section of the Info Palette, or by dragging the color over the light marker:

Although when selected the light is surrounded by a bounding sphere, rotating point lights makes no difference to the lighting effect. If you deselect the light, a small sphere (the light marker) will remain in the window to indicate its position.

#### Spot Lights

Return to the Tools Palette, click on the Point Light tool, hold down the mouse button and select the Spot Light tool from the popup menu. Click in the document window to place the light:

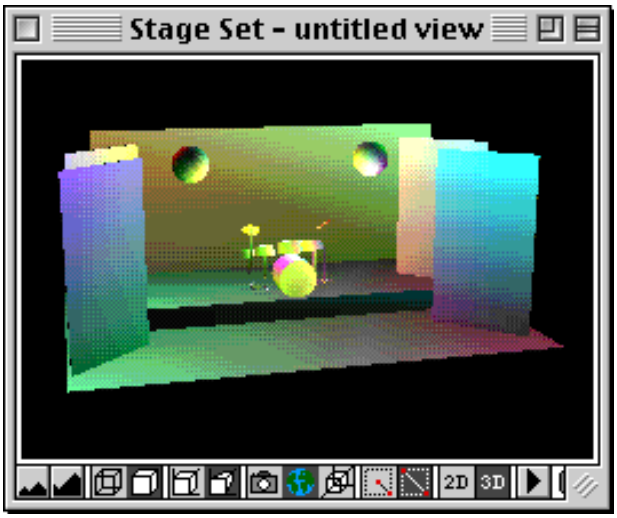



Spot lights are directional and can be rotated to shine light in different directions. You can also use the controls in the Info Palette to change the characteristics of a spot light, such as its color, Brightness, Spread and Sharpness:

When you have lit the scene how you want, uncheck the Show Lights checkbox in the Lights Palette. The light markers will disappear, but their effect will still be apparent.

## ◆ Tutorial Stage Set

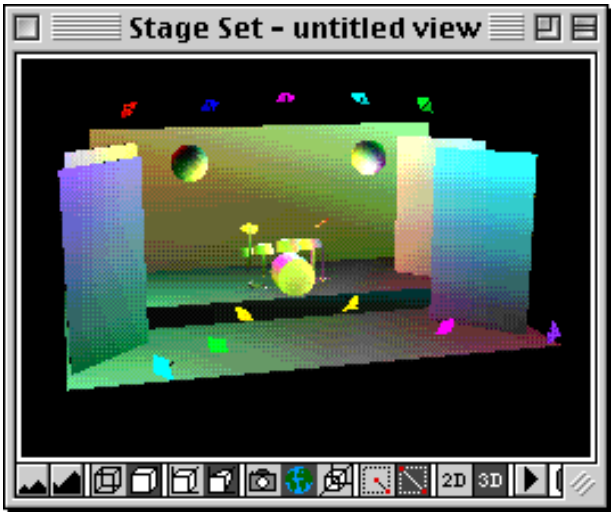
Close the document you have been working on (you do not need to save it). Choose Open from the File menu and open the document “Tutorial Stage Set” that is supplied with 3D World.



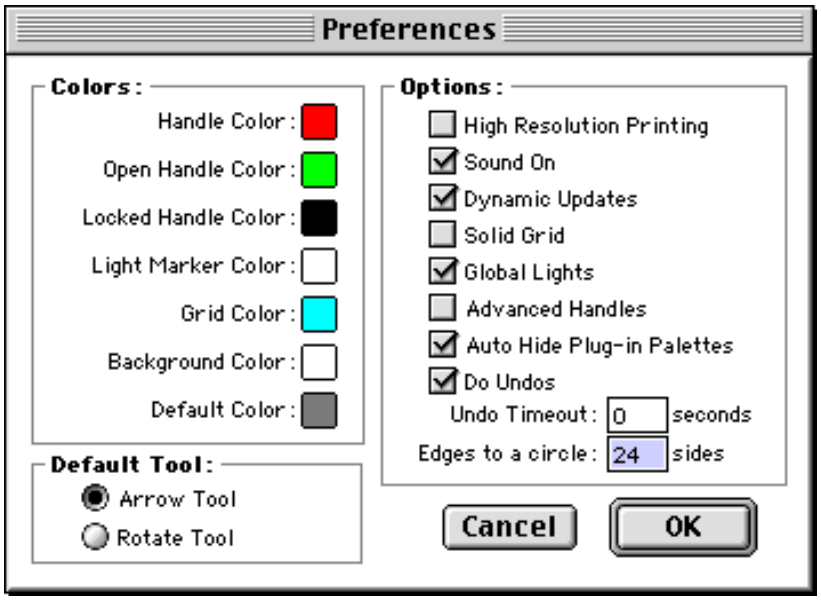

There are many different colors in this document, which are produced by shining different colored lights on the set. Use the check box to the right of the Spot/Point Brightness slider in the Lights palette to turn off the lights, which causes the scene to go black.

Switch on Ambient light by clicking on the check box to the right of the Ambient Brightness slider. You will see that most of the panels are white. Next, turn on Sun light by checking the box to the right of the Sun Brightness slider. Notice the difference that sunlight makes to the scene.

Turn off the Sun and Ambient lights and turn on the Spot/Point lights. To see the lights that are illuminating the stage set, click on the Show Lights check box at the bottom of the Lights Palette:




Choose Preferences from the Edit menu:

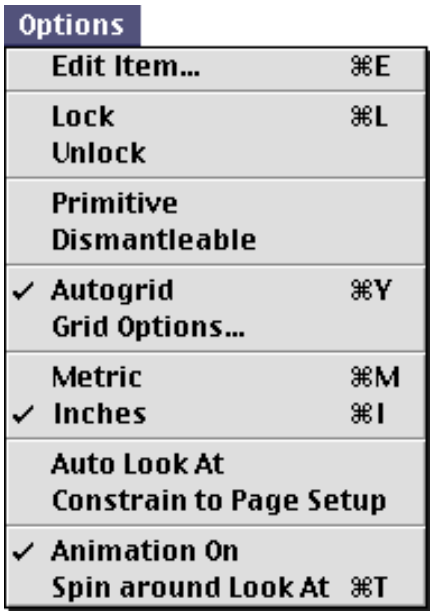



Make sure that the Light Marker Color is white (this means that the light markers will display with the same color as the light they are emitting). Also make sure that the Sound On check box is checked, then click OK.

Select a light and rotate it to see the difference it makes to the scene. Then, hide the lights again by unchecking the Show Lights check box in the Lights Palette.

Click on one of the drums or cymbals to play the sounds that have been attached.

Select Spin Around Look At from the Options menu to spin the stage:




The right or left arrow keys can be held down to speed up or slow down the spin, and reverse its direction. Click anywhere in the window to stop the stage from spinning.

## ◆ Summary

We hope this tutorial has shown you some of the things that you can do with 3D World. Go ahead and try drawing your own scenes. For further explanation of tools and menu items, refer to the Reference sections of this manual.

# Chapter 3

# Menus

Details of the application's File, Edit, View, Options, Palettes, Plug-in and Help menus. Command key shortcuts can be used to perform many menu commands. *See Appendix L — Command Key Table on page L-1 for details.*

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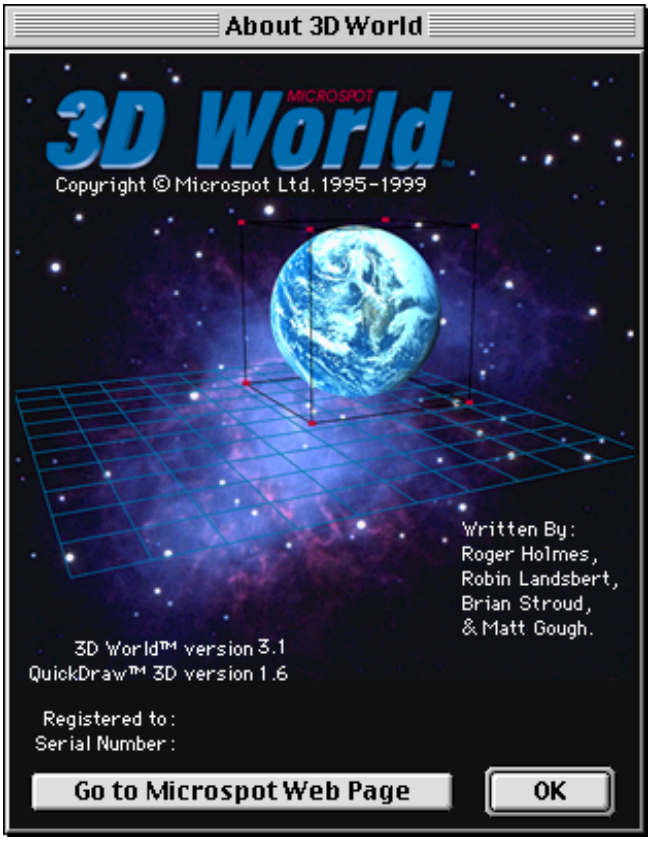
## APPLE MENU

Click on the Apple icon at the top left of the screen to display the Apple menu. The top two items relate to 3D World:

### ◆ About 3D World

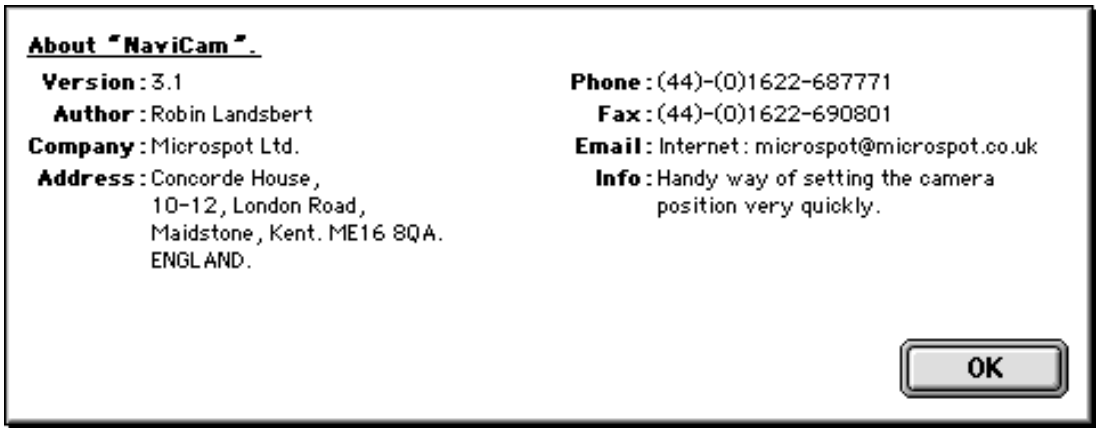
Select About 3D World to display the About 3D World dialog. This provides information about the version of the application and QuickDraw 3D you are running, registration and serial number details.



## About Plug-ins

Select About Plug-ins and hold down the mouse button to display the list of the plug-ins that are currently running:

Select a plug-in name from the list to display a dialog containing brief details about the plug-in.



## FILE MENU

### ◆ New

Opens a new, untitled document.

If there is a document called Default Stationery Pad located in the same folder as the application, a copy of this document will be opened as an untitled document (a document is tagged as a stationery pad via the Get Info dialog). This allows you to use the same customized settings for each document.

### ◆ Open

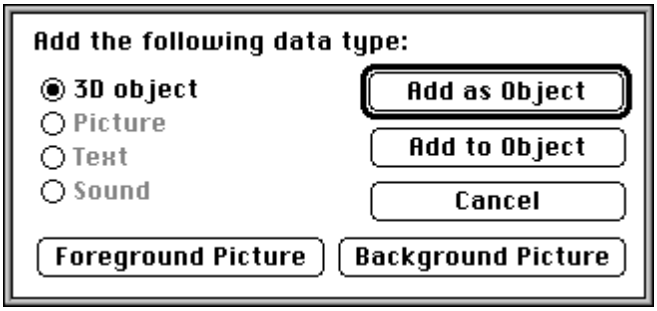
Opens an existing 3D World file, or any other file created by a QuickDraw 3D-compatible application.

Select Open and a standard dialog displays for you to select the file to open.

## ◆ Insert

Select Insert to bring QuickDraw 3D, picture, or text files into documents.

When the standard dialog displays, select a file to insert. The Insert Dialog will display:

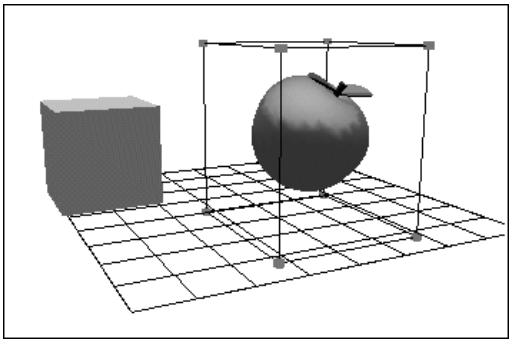



The options available will depend upon the type of file selected, and whether an object was selected when Insert was chosen. The type of file selected will be indicated on the left side of the dialog.

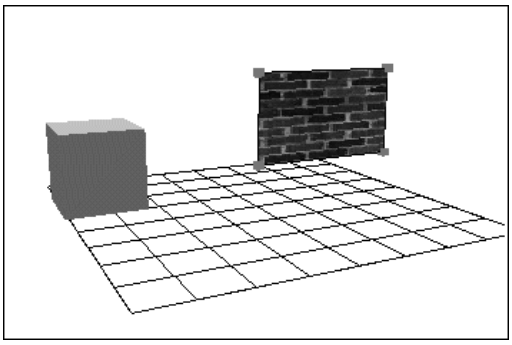
### Add as Object

The selected file appears either in the center of the grid or at the last place the mouse was clicked.

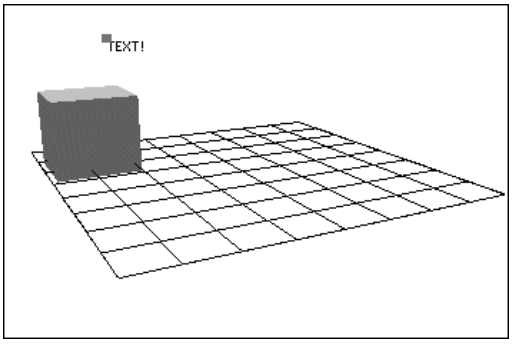
- **QuickDraw 3D file:** Appears as a 3D object, the orientation of which will depend on the information contained in the QuickDraw 3D file.



- **Picture file:** The image displays as a rectangle with the same proportions as the original picture. The longest side of the rectangle is equivalent to the length of one side of one grid square and its orientation relates to the grid.



- **Text file:** Text is placed in the document as a text marker. The marker has a specific location within the document, but the text is always displayed perpendicular to the camera, regardless of the view.



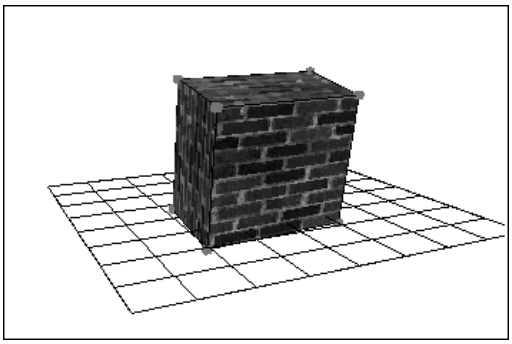

### Add to Object

This option is only available if an object was selected in the document before Insert was chosen. The file is converted to a picture (if necessary) and applied to the selected object as a texture. The properties of the selected object will determine how it is applied.

Available for:

- **QuickDraw 3D file**

- **Picture file**



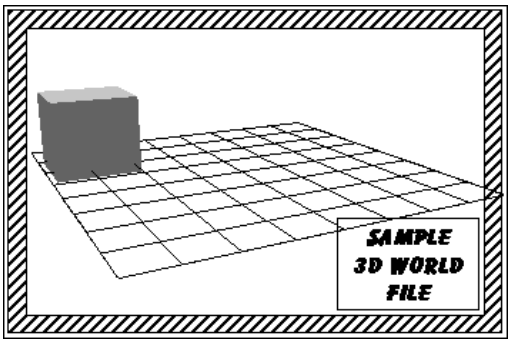
- **Text file**

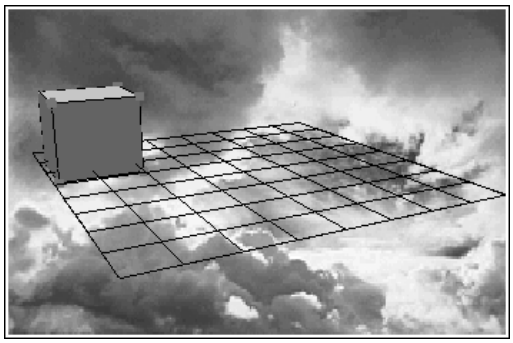
### Foreground/Background Picture

The file is converted to a picture (if necessary) and placed in the foreground/background where it remains even if the view changes. If the proportions of the image are not the same as the proportions of the window, the image is distorted to fit the window. Its size remains constant relative to the window size.

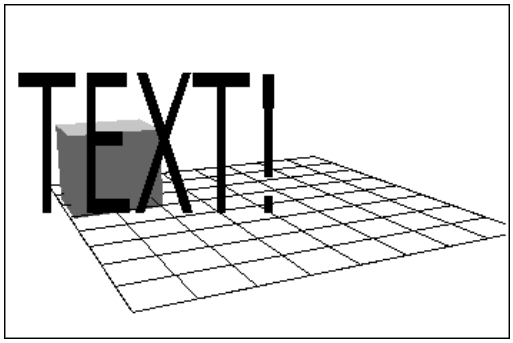
Available for:

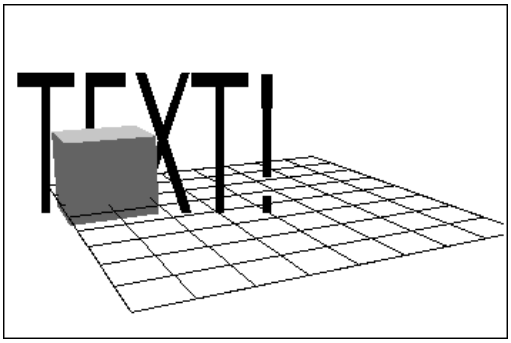
- **QuickDraw 3D file**
- **Picture file**



- **Text file**




## Import

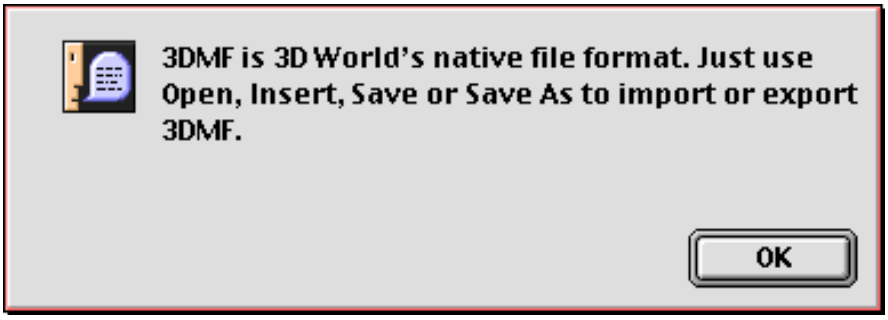
The Import submenu allows you to access Import options.

Open the file menu and select Import. A submenu lists the Import options. Select the option you wish to use from the list.

3DMF is the only Import option that is part of the application. All other Import options are plug-ins. *See Appendix A — Import Plug-ins on page A-1 for more details.*

### 3DMF

Select 3DMF and the following dialog displays:



As 3DMF is the native file format of the application, you can import 3DMF objects by

- Using the Insert command. *See Insert on page 3-6 for further details.*
- Opening a 3DMF document and dragging and dropping items from the new document to the current document. *See Open on page 3-5 and Appendix J — Drag and Drop on page J-1 for details.*
- Dragging and dropping a 3DMF file from the Finder into the document. *See Appendix J — Drag and Drop on page J-1 for details.*

## ◆ Export

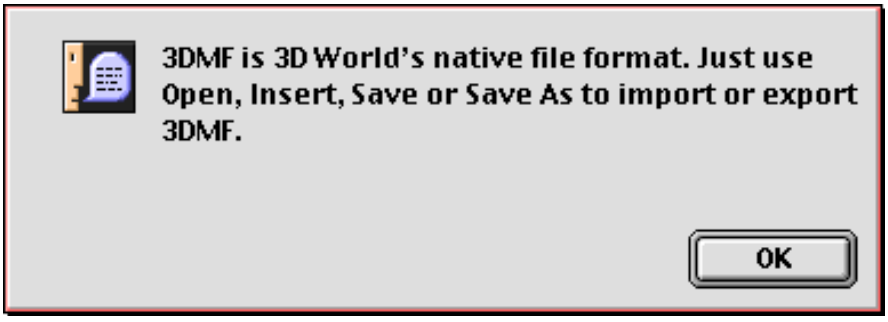
The Export submenu allows you to access Export options.

Open the file menu and select Export. A submenu lists the Export options. Select the option you wish to use from the list.

3DMF is the only Export option that is part of the application. All other Export options are plug-ins. *See Appendix B — Export Plug-ins on page B-1 for more details.*

### 3DMF

Select 3DMF and the following dialog displays:




As 3DMF is the native file format of the application, you can export 3DMF objects by

- Using the Save or Save As command. *See Save on page 3-11 and Save As on page 3-11 for further details.*
- Dragging and dropping items from the document to the Finder or another application that supports 3DMF and Drag and Drop. *See Appendix J — Drag and Drop on page J-1 for details.*

## ◆ Close

Closes the current document and its associated windows. If the document has not been saved, or if changes have been made to it since it was last saved, an alert will display asking if you want to save the document before closing.

## ◆ Save

The Save option is only available if a document has never been saved, or if changes have been made to it since it was last saved. Using the Save option saves the document in 3D metafile format. If the document has not been saved before, a dialog will display for you to specify the document name and a location to save it.

To save a document as a stationery pad, give it the name Default Stationery Pad. The document will be automatically tagged as a stationery pad. *See New on page 3-5 for further details.*

## ◆ Save As

Choose to save a document (in 3D metafile format) under a different name or in a different location. If you try to save a document in the same location as a document of the same name, an alert will ask if you wish to replace the existing file.

### ◆ Revert

Returns to the last saved version of a document. (This option will only be available if the document has been previously saved.) An alert will display to ask if you are sure you wish to revert.

### ◆ Page Setup

Select to display the Page Setup dialog. The options available in the Page Setup dialog will depend on the printer driver you have selected in the Chooser.

### ◆ Print

Select to display the Print dialog. The options available in the Print dialog will depend on the printer driver you have selected in the Chooser.

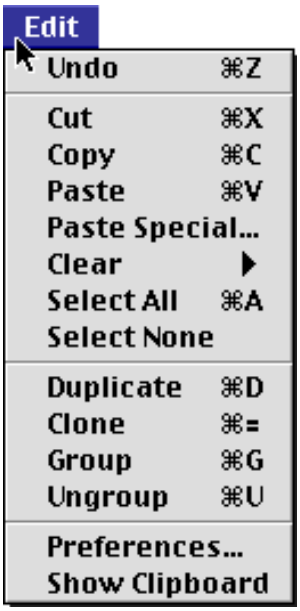
### ◆ Print One

Prints one copy of the current window without displaying the Page Setup and Print Dialogs.

### ◆ Quit

Quits the application and closes all open files and their associated windows. If any open files have been changed without being saved, a dialog will display asking if you wish to save the changes.

## EDIT MENU




### ◆ Undo

Allows you to undo your last object manipulation. Selections, de-selections, mode changes and view changes are not object manipulations, and therefore cannot be undone.

This option will be disabled if no document is open, if an open document has not been changed since it was last saved, or if Do Undos has been turned off in the Preferences dialog. *See Options on page 3-25 for further details.*

After an object manipulation has been undone, the Undo option will change to Redo. Select Redo to perform the action again.

## ◆ Cut

Removes a selected item from the current document and places it on the clipboard where it remains until replaced by another item cut or copied from the document.

## ◆ Copy

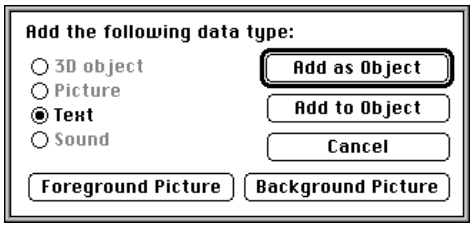
Copies a selected item from the current document and places it on the clipboard where it remains until replaced by another item cut or copied from the document.

## ◆ Paste

Pastes items into the current file either in the center of the grid or at the last place the mouse was clicked. 3DMF, PICT, text, and sound files can be pasted into 3D World documents. 3DMF data are pasted in as 3D objects; PICT files are pasted in as rectangles; text and sound data are pasted in as markers.

## ◆ Paste Special

Paste Special is only available if you have cut or copied items from an application other than 3D World. When you select Paste Special, the following dialog displays:



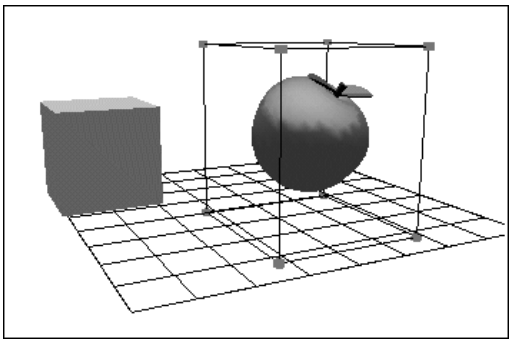

Items cut or copied from other applications can be placed in 3D World documents in a variety of ways, depending on their formats. If you have cut or copied multiple data types, you can use the list on the left of the Paste Special dialog to select the data type you want to place in your document.

The Paste Special options available to you will depend on the type of file selected, and whether an object was selected prior to choosing Paste Special.

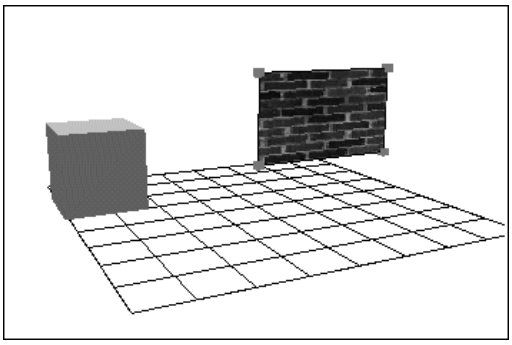
### Add as Object

The file will appear either in the center of the grid or at the last place the mouse was clicked.

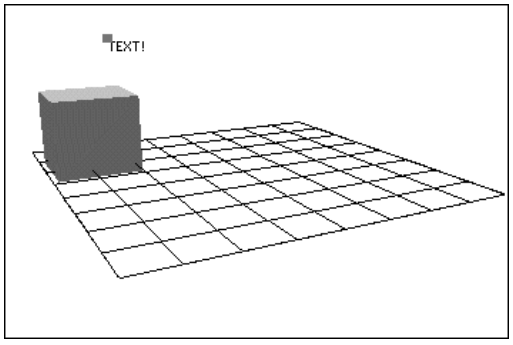
- **3D Object:** Appears as a 3DMF, the orientation of which depends on the information contained in the 3D object file.

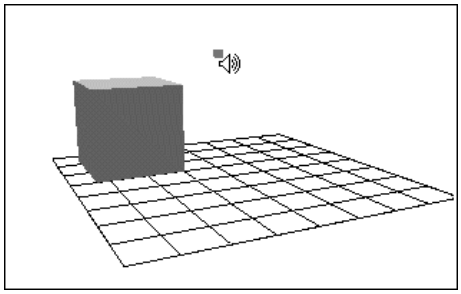


- **Picture:** The image displays as a rectangle with the same proportions as the original picture. The longest side of the rectangle is equivalent to the length of one side of one grid square, and its orientation relates to the grid.



- **Text/Sound:** Placed in the document as a text/sound marker. The marker has a specific location within the document, but always displays perpendicular to the camera, regardless of the view.



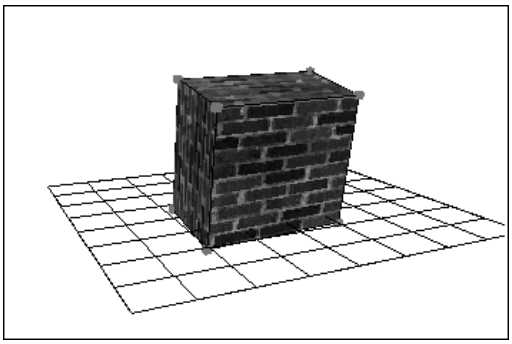
#### Add to Object

This option is only available if an object was selected in the document prior to choosing Paste Special.

Available for:

- **3D object:** The file is converted to a picture and applied to the selected object as a texture. The properties of the selected object will determine how it is applied.

- **Picture:** The file is applied to the selected object as a texture. The properties of the selected object will determine how it is applied.



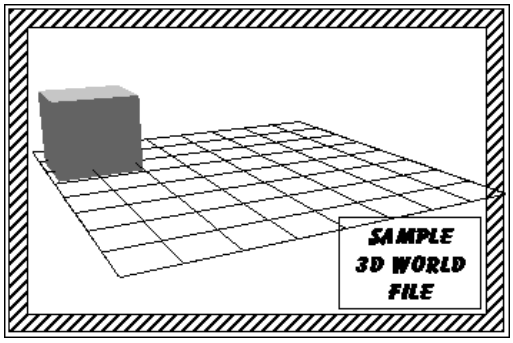
- **Text:** The file is converted to a picture and applied to the selected object as a texture. The properties of the selected object will determine how it is applied.
- **Sound:** The sound is applied to the selected object as an attribute. To play the sound, click on the object.

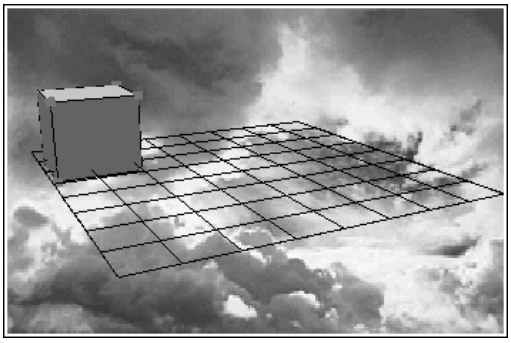
#### Foreground/Background Picture

The file is converted to a picture (if necessary) and displayed in the document foreground/background where it remains even if the view changes. If the proportions of the image are not the same as the proportions of the window, the image is distorted to fit the window. Its size remains constant, relative to the window size.

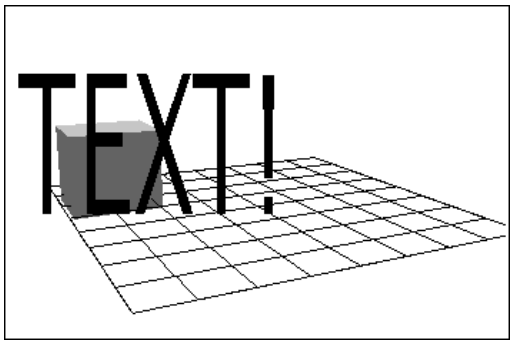
Available for:

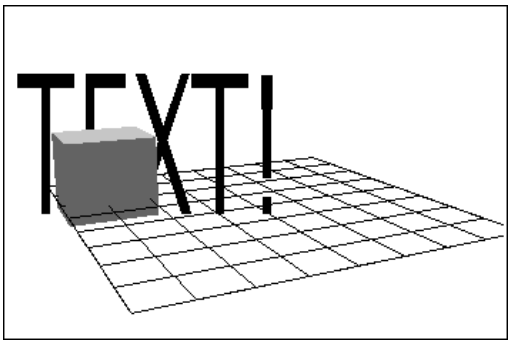
- **3D object**
- **Picture**



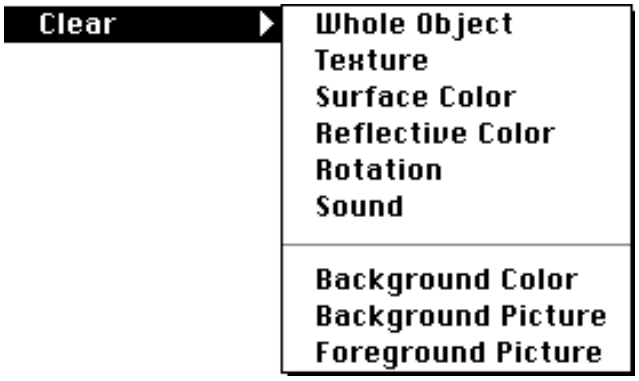



- **Text**




## ◆ Clear




Use the Clear command to remove items or attributes without placing them on the clipboard. The six options in the top part of the popup menu are only available if an item is selected within the document before Clear is chosen.

Select the appropriate option to clear the entire object, or a specific attribute of the object. An entire object can also be cleared from a file by dragging and dropping it into the trash can. Although the object will be removed from the file, a clipping will remain in the trash can until it is emptied. This allows you to drag and drop the item back into the document if necessary.

The last three options in the Clear menu allow you to remove the document's background color, background picture and foreground picture.

## ◆ Select All

Selects all of the objects in the current window.

## ◆ Select None

Deselects all of the selected items in the current window.

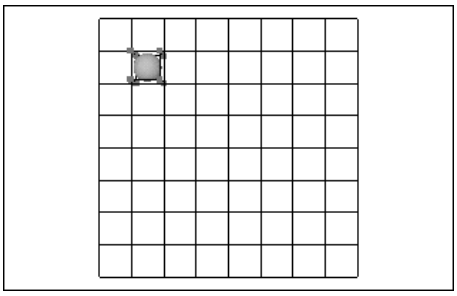
## ◆ Duplicate/Clone

**Note:** Clone is available only if QuickDraw 3D version 1.0.4 or later is installed, otherwise it will be grayed out. This is due to a bug in prior versions of QuickDraw 3D.

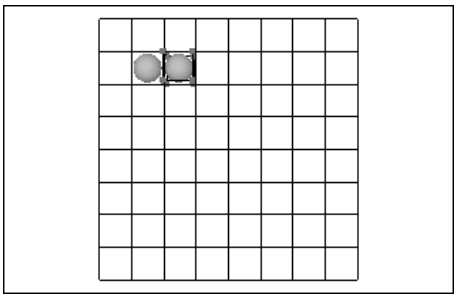
The Duplicate and Clone operations appear identical, however, when an object is duplicated, the duplicate is created as an entirely separate item and is unrelated to the original. When an object is cloned, the clones share the same basic geometry and surface attributes as the original. This means that if the geometry, color, transparency, shininess etc. of the original is changed, any clones will also be changed, and if a clone is changed, other clones and the original will be changed. The link relates to the basic geometry and surface attributes only. Changes in size, position and rotation will not be reflected by the clones.

The Clone command can be very useful in certain situations as due to their shared attributes, clones use less memory than duplicates, and changes can be made quickly to several cloned objects at once.

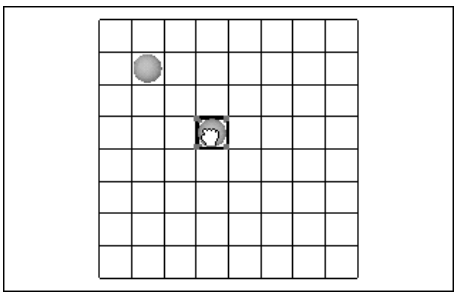
1. Select an item or group of items and choose Duplicate/Clone.



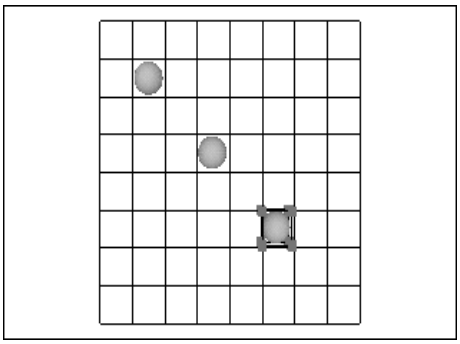
2. A duplicate/clone of the selected item or group of items is placed one grid square to the right of the original:



3. Move the duplicate/clone and choose Duplicate/Clone again.



4. The second duplicate/clone will be positioned in the same position relative to the first duplicate/clone, as the first duplicate/clone was to the original:



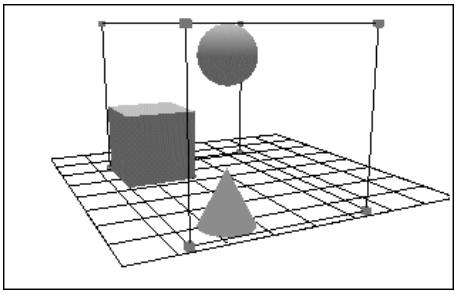
Any rotations that are applied after the first duplication are also applied to subsequent duplicated items. This is useful for drawing items like spiral staircases.

Hold down the Shift key when using the Duplicate/Clone option to avoid applying any offset.

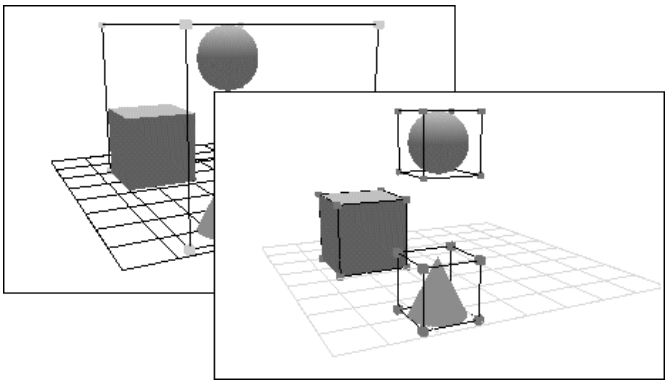
## ◆ Group

Groups two or more objects and allows them to be manipulated as a single object.

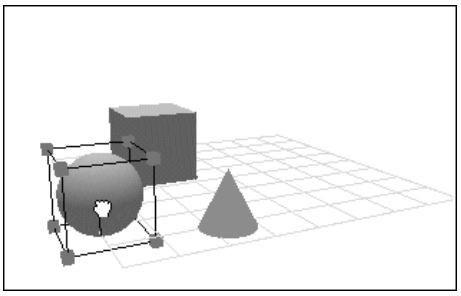
1. Select the desired items, then choose Group. Grouped items will be surrounded by a bounding rectangle or sphere depending on whether the arrow or rotate tool was used to select them:

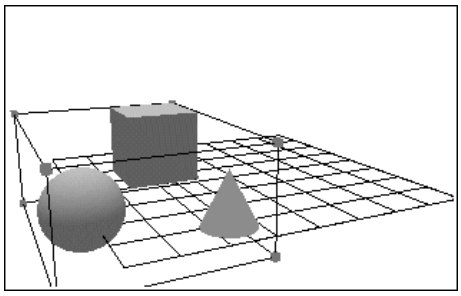


2. Double-click on the group or choose Edit Item from the Options menu to open a new window containing only the items within the group:



3. Manipulate these items individually, then close the window to view your changes in the original document:





While a Group window is open, the handles of the bounding rectangle or sphere around the original grouped items will change color. This indicates that the objects are selected, and the Group window is open. The color of the handles is set in the Preferences dialog. *See Color Preferences on page 3-24 for further details.*

If the grouped objects have been placed in further groups, the Group window will contain grouped objects. Double-clicking on these groups will open additional windows showing the contents of their respective groups.

If a group of objects is flagged as Primitive, it is not possible to edit the items within the group by double-clicking on the group or choosing Edit Item from the Options menu. The group must be flagged as Dismantleable before the individual items can be edited. The Primitive and Dismantleable options are available in the Options menu and the Info palette, and are discussed further in the sections *Primitive on page 3-36, Dismantleable on page 3-37 and Primitive/Dismantleable Flag on page 4-18.*

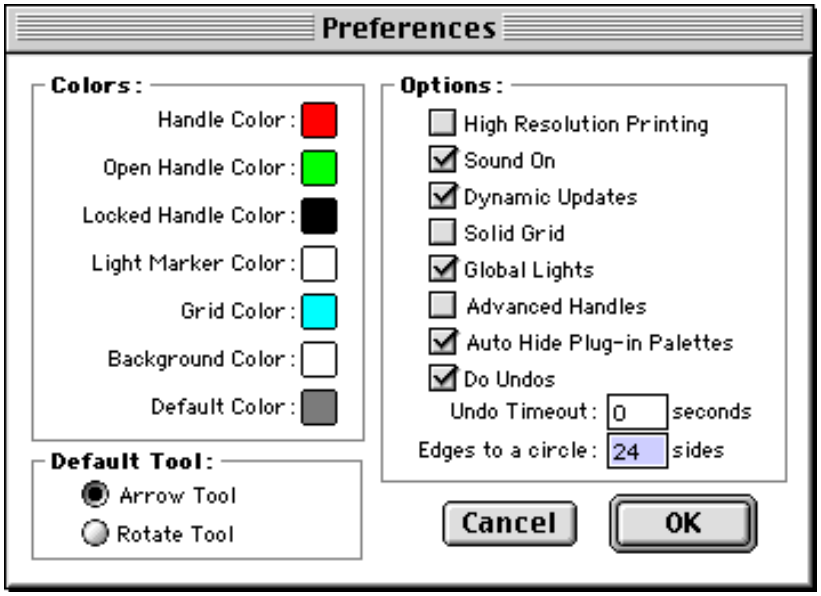
## ◆ Ungroup

Ungroups selected items so that members of a group can be selected individually. Note that this option only ungroups one level at a time.

If a group is flagged as Primitive, the Ungroup option will be grayed out in the Edit menu, and will not be selectable. The group must be flagged as Dismantleable before it can be ungrouped. The Primitive and Dismantleable options are available in the Options menu and the Info palette, and are discussed further in the sections *Primitive on page 3-36, Dismantleable on page 3-37 and Primitive/Dismantleable Flag on page 4-18*.

## ◆ Preferences

Select Preferences to display the Preferences dialog:




### Color Preferences

To change color preferences, click on a color square to display the Color Picker. Select a new color and close the Color Picker.

- **Handle Color:** The color of the handles on the bounding frame of a selected object.
- **Open Handle Color:** The color of the handles on the bounding frame of a group of objects when an Editing or Group window is open.
- **Locked Handle Color:** The color of the handles on the bounding frame of a locked object.
- **Light Marker Color:** The color of the cone or point marking the position of a Spot/Point Light. If this color is set to white, the color of each light marker will be the same as the color of the light.
- **Grid Color:** The color of the grid.
- **Background Color:** The color displayed in the background of a new file.

- **Default Color:** This is the color that displays in the color block in the window toolbar and is used to draw new objects.

### Default Tool

Choose either the Arrow or Rotate Tool as the default tool.

### Options

- **High Resolution Printing:** Click to print at printer resolution rather than screen resolution.
- **Sound On:** Click to play sounds within the application.
- **Dynamic Updates:** If this option is enabled, all open windows for a particular document will automatically be updated as objects are created or manipulated in the active window and as slider bar controls in palettes are changed. If this option is not enabled, only the active window will be updated as actions are performed. Other open windows will not be updated until the action is complete and when moving slider controls, views will not be updated until the mouse is released.
- **Solid Grid:** Click to specify that the document grid should appear as a solid floor rather than a wire frame grid.
- **Global Lights:** When this check box is enabled, the controls in the Lights palette relate to the document. When it is not enabled, the controls in the Lights palette relate to the active window only.
- **Advanced Handles:** When this option is checked on, the lines of the bounding frame of an object can be clicked on and dragged to resize the object. The default setting is off.
- **Auto Hide Plug-in Palettes:** When this option is checked on, whenever a plug-in tool is selected in the Tools palette, any plug-in palettes currently open are closed. This helps to prevent your work space from becoming too cluttered.
- **Do Undos:** The Do Undos checkbox is used to specify whether or not you wish to be able to use the Undo command. It is checked on by default.

  To be able to perform an Undo command, the application must store a copy of the document (or parts of it) before carrying out any action that will change the document. This means that you could need twice as much memory to be available for the application as the document itself requires. It also means that for large documents, the time it takes for the application to store the copy of the file may result in unacceptably slow updates as you edit your document. Unchecking the Do Undos checkbox will therefor allow the application to use less memory and also speed up the updating of large documents.

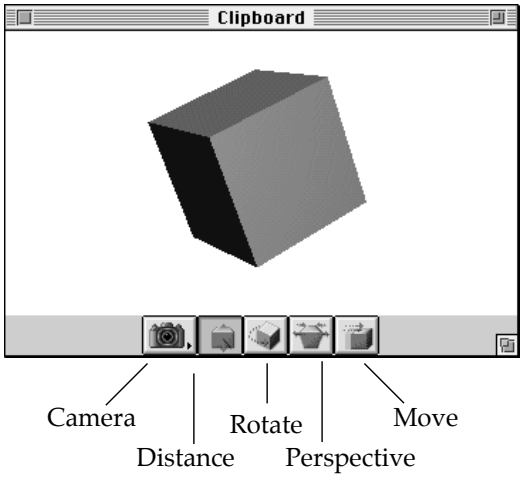
- **Undo Time-out:** As an alternative to completely disabling the Undo command, you can leave the Do Undos checkbox checked on, and enter a value in seconds in the Undo Time-out field. This specifies the amount of time that you are prepared to give the application to store a copy of the document. If a copy of the document cannot be stored in the time specified, no copy will be saved and the Undo command will not be available. The default setting of 0 seconds gives unlimited time.
- **Edges to a Circle:** Enter a value for the number of sides a circle should have. This will affect the appearance of circles, spheres, cylinders, etc. The lower the value, the coarser the curve. The higher the value, the more memory and disk space you will need to display and store the images. The default value is 24.

## ◆ Show Clipboard

Choose this option to display the clipboard, which stores items that have been cut or copied from applications. The contents of the external clipboard can only be displayed if they can be recognized.

**Note:** The clipboard is part of QuickDraw 3D and so may look different or have more or fewer controls depending on the version of QuickDraw 3D you have installed.

Use the controls at the bottom of the Clipboard window to view stored items:



### Camera

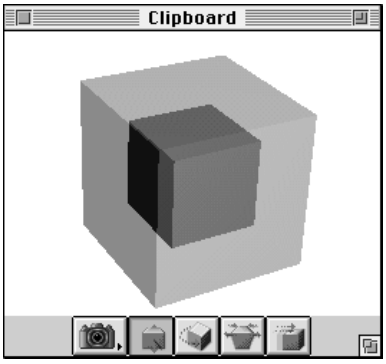
Click on the Camera icon and hold down the mouse to display the Camera popup menu.

Use the options in the Camera menu to change the view of an item on the clipboard. The options available will depend on the version of QuickDraw 3D installed.

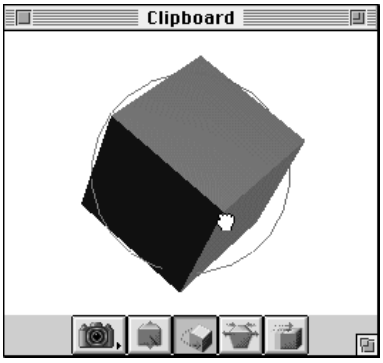
### Viewing Tools

Click on an icon and move the cursor over the item in the Clipboard window. Hold down the mouse, then click and drag over the item

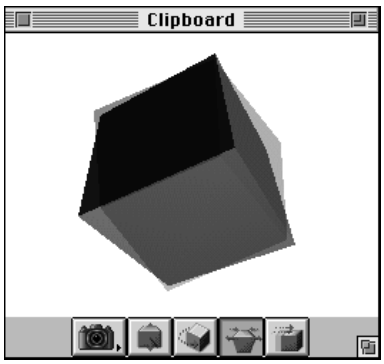
- **Distance:** Use to move closer to, or further away from, an item:



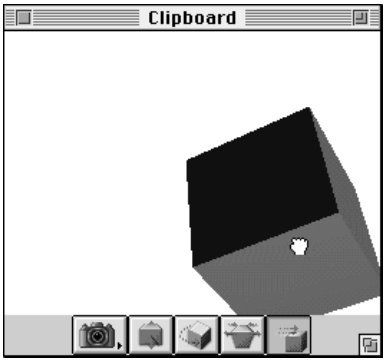

- **Rotate:** Use to rotate an item. To rotate the camera around the item, position the cursor over the clipboard's background and drag while holding down the mouse:



- **Perspective:** Changes the perspective view of an item:




- **Move**: Moves an object up, down, left or right:



## VIEW MENU

### ◆ New Window

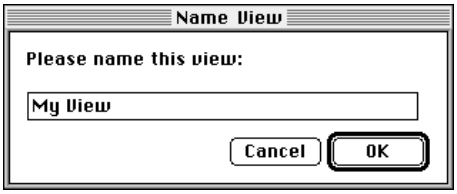
Opens a new window for the current document. The new window displays the same view as the original window, and is offset from it. Use the Change View menu to change the view in the new window to display a different view of the same document. *See Change View on page 3-31 for further details.*

### ◆ Close Window

Closes the current window. If this is the last open window for a document, the document will also be closed. If you have made changes to the document since it was last saved, an alert displays asking if you want to save the changes. If you save your changes then later reopen the document, the same view as when the document was closed will be displayed. To save a view with a name, use the Name View option before closing the window. *See Name View on page 3-30 for further details.*

## ◆ Name View

Saves the current view. Enter a name for the view in the dialog that displays:




You cannot use the names of the standard views included in the program. If you specify a name that has already been used to save a nonstandard view, an alert displays asking if you want to replace that view.

## ◆ Delete View

Deletes a saved view. This option is only available when new views have been created and saved (standard program views cannot be deleted).

1. Select Delete View and a submenu lists the views that may be deleted:

2. Select the name of the view to delete from the submenu and the view will be deleted.

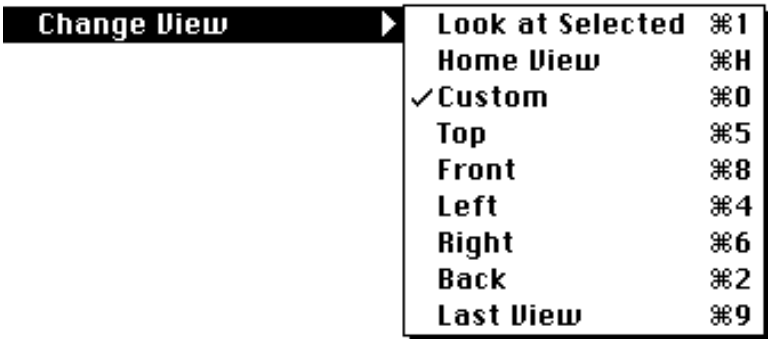
3. If you do not select a view from the submenu, the delete view dialog displays showing the views that can be deleted

4. Select the view to delete and click OK.

**Note:** If a document window was displaying a view that has now been deleted, the window will remain open as an untitled view.

## ◆ Change View

Click on Change View to display a popup menu which lists the available views (including any that you have saved). The view in the current window will be indicated by a check mark. Move the cursor down the list to select the desired view:

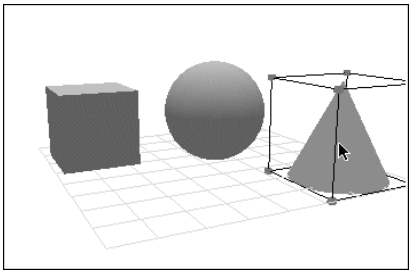


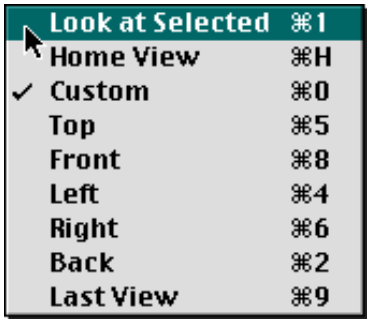
The current window will change to reflect your choice. If a standard view has been changed, hold down the Option key and select the name of the standard view to reset it to the default standard view.

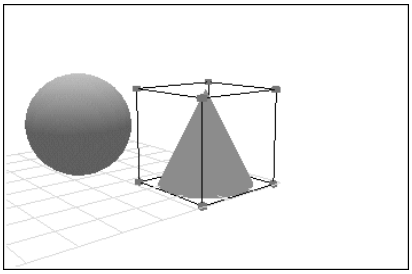
The view displayed can also be changed via the Command key shortcuts shown in the Change View popup menu above, or through the popup menu in the Window controls. *See View on page 4-34 for further details*..

#### Look at Selected

Displays a selected object in the center of the window:

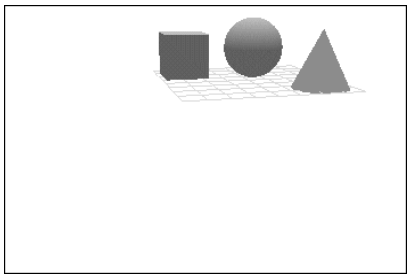


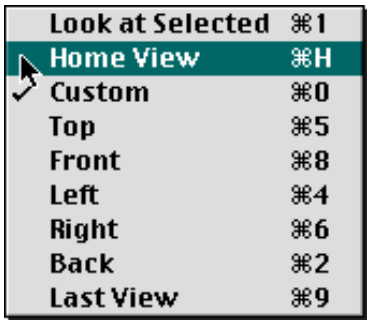


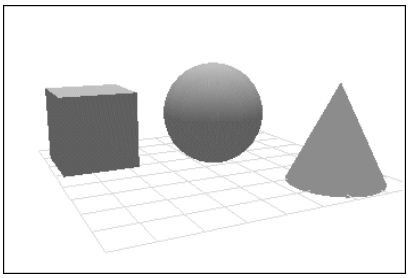



#### Home View

Returns the camera to its initial position (the view displayed when a new file is opened):





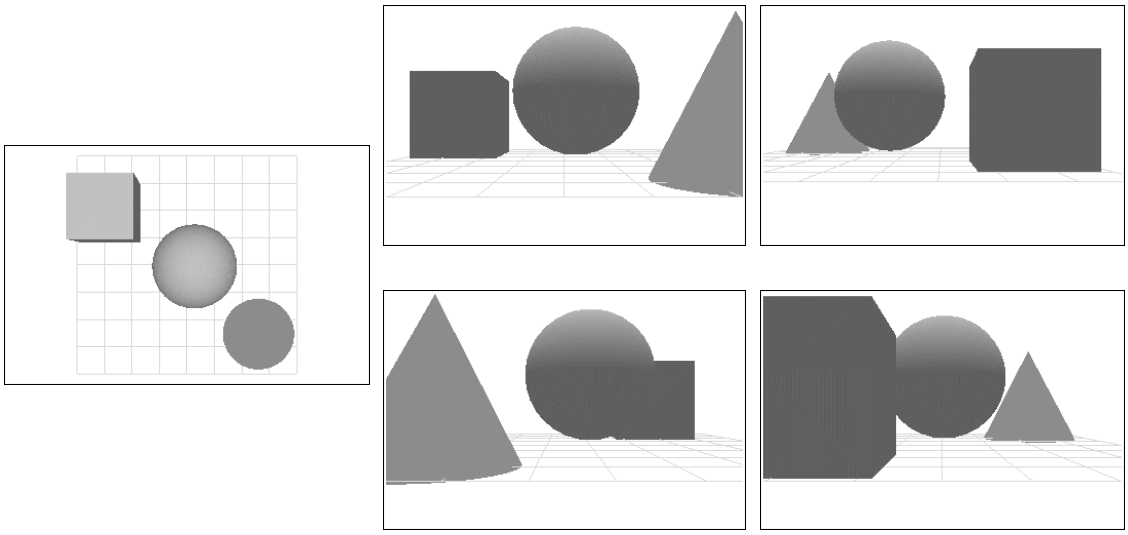



#### Custom

Any nonstandard view, or any view that has not been saved is a Custom view.

#### Top, Front, Left, Right and Back

The five standard views that allow you to display the file from the sides and top:

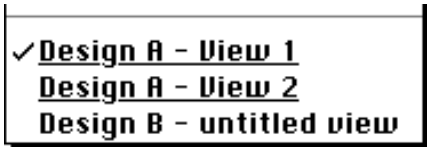


#### Last View

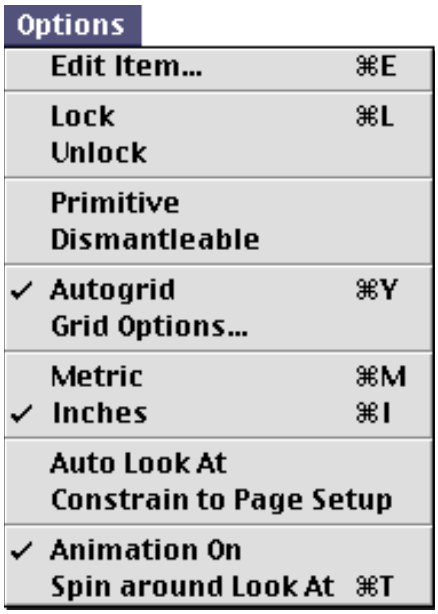
The view that was displayed in the window immediately prior to the current view.

## ◆ Open Documents

At the bottom of the view menu is a list of the documents and views that are currently open. The active window has a check mark to the left of its name. Documents that have been changed since they were saved are underlined. Select a document/window name from the list to make it the active window:



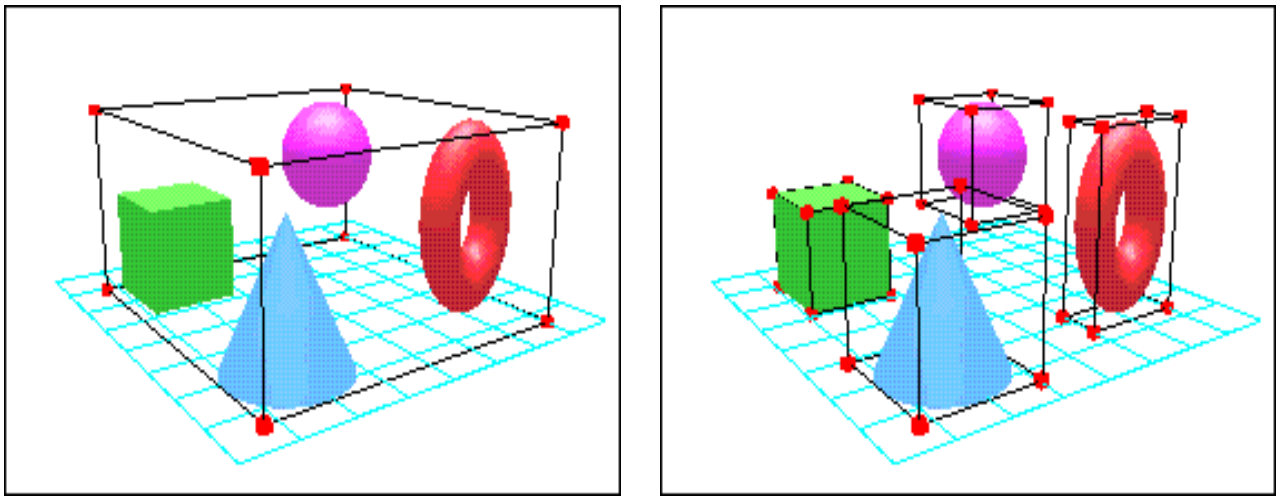
## OPTIONS MENU



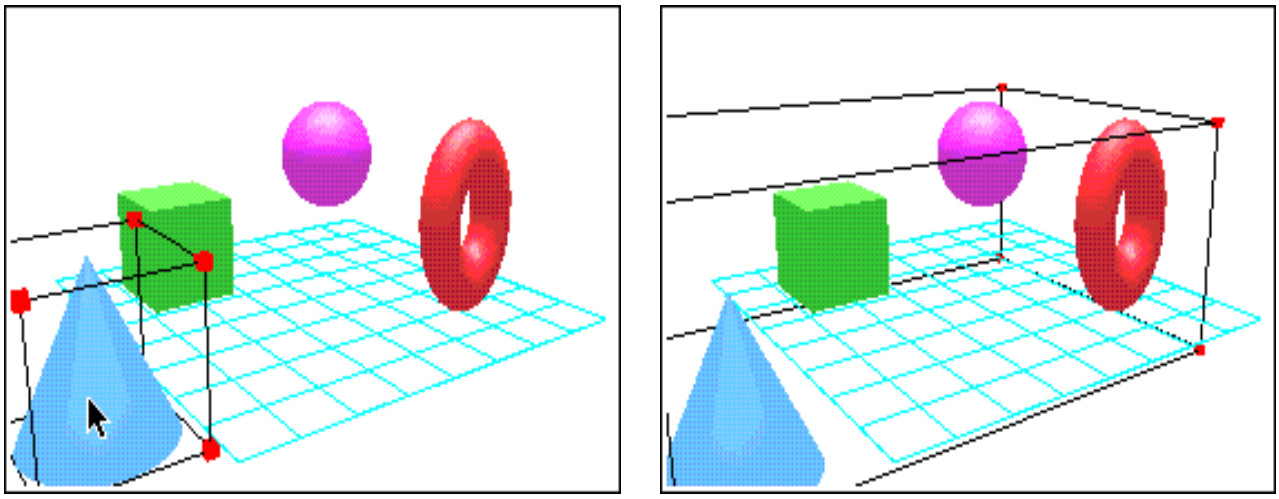

### ◆ Edit Item

Select to edit individual objects within a group.

Double-click on the group, or select the group and choose Edit Item from the Options menu, to display a new window which contains only the items in the group.



The items can now be edited individually. As you edit the individual items, the group remains locked in the original file window, although it will be updated to reflect any changes you make.



Hold down the Option key when closing an editing window, and all editing windows for that file will be closed.

Items and groups can be flagged as Primitive or Dismantleable. If the selected group has been flagged as Primitive, Edit Item will be grayed out and will not be selectable. Flag the group as Dismantleable to edit it. The Primitive and Dismantleable options are available in the Options

menu and the Info palette. *See Primitive on page 3-36, Dismantleable on page 3-37, and Primitive/Dismantleable Flag on page 4-18 for further details.*

## ◆ Lock

Protects a selected object or group from being changed. A locked object can be grouped with other objects, but cannot be moved, resized or changed. If you group a locked object with other objects, the entire group will be locked.

If you place the cursor over a locked object, it will display as a padlock.

An object or group can also be locked by selecting it and clicking on the large open padlock icon in the top right corner of the Info Palette. *See Lock on page 4-19 for further details.*

## ◆ Unlock

Select a locked object or group and choose Unlock to remove the protection against changes. An object or group can also be unlocked by selecting it and clicking on the large closed padlock icon in the top right corner of the Info Palette. *See Lock on page 4-19 for further details.*

## ◆ Primitive

Specifies that an item or group should be treated as a basic geometry. A basic geometry cannot be ungrouped, so individual surfaces or items cannot be edited. An alternate method of specifying an object as a Primitive is to click on the Primitive/Dismantle button in the Info Palette. *See Primitive/Dismantleable Flag on page 4-18 for further details.*

## ◆ Dismantleable

Specify that an item or group can be broken down into its component parts. This will allow you to ungroup an item or items and edit individual components as separate items. An alternative method of specifying an object as Dismantleable is to click on the Primitive/Dismantle button in the Info Palette. *See Primitive/Dismantleable Flag on page 4-18 for further details.*

## ◆ Autogrid

Autogrid applies an invisible grid to the document to which object points can snap. It is enabled by default to make it easier to align objects. The distances between the nodes on this grid are determined by the value entered for the Snapping Grid Distance in the Grid Options dialog. *See Grid Options on page 3-38 for further details.*

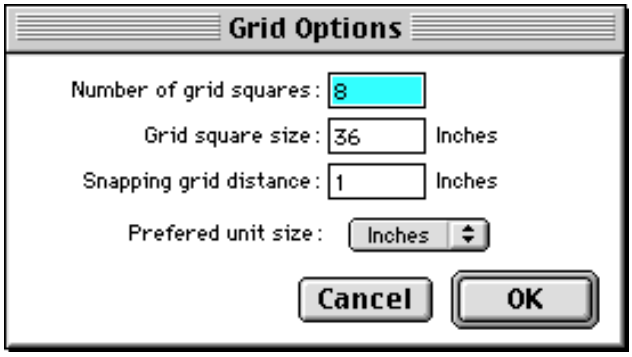
When Autogrid is enabled and a new item is drawn, the cursor is positioned on the closest snapping grid intersection. As the object is drawn, the object's handles snap to the snapping grid's intersection points. As an object is resized, the object's handles are positioned on snapping grid intersection points. When an item is moved, its center point will snap to the snapping grid intersection points.

If Autogrid was disabled when an object was randomly positioned in the file, the item will be moved or resized in increments of the snapping grid distance when Autogrid is enabled.

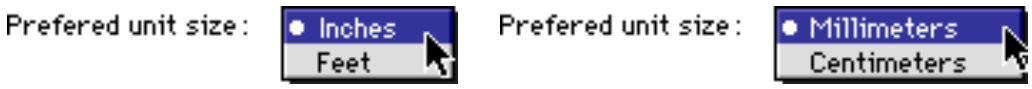
Reselect the Autogrid option in the Options menu to turn this option off.

## ◆ Grid Options

Choose Grid Options to display the Grid Options dialog:




- **Number of grid squares:** This value relates to the visible grid. Enter a value to specify the number of grid squares that should make up one side of the grid.
- **Grid square size:** This value relates to the visible grid. Enter a value to specify the length of one side of one grid square.
- **Snapping grid distance:** This value defines the invisible snapping grid. Enter a value for the length of one side of one snapping grid square. Typically, you will want to give the snapping grid distance a value that is a fraction or multiple of one document grid square.
- **Preferred unit size:** This option allows you to select a unit size.




The entries in the popup menu are determined by whether metric or inches has been selected in the Options menu as discussed below.

## ◆ Metric

Select this option to use metric units of measurement. The grid size, position coordinates and dimensions will all be calculated using metric units.

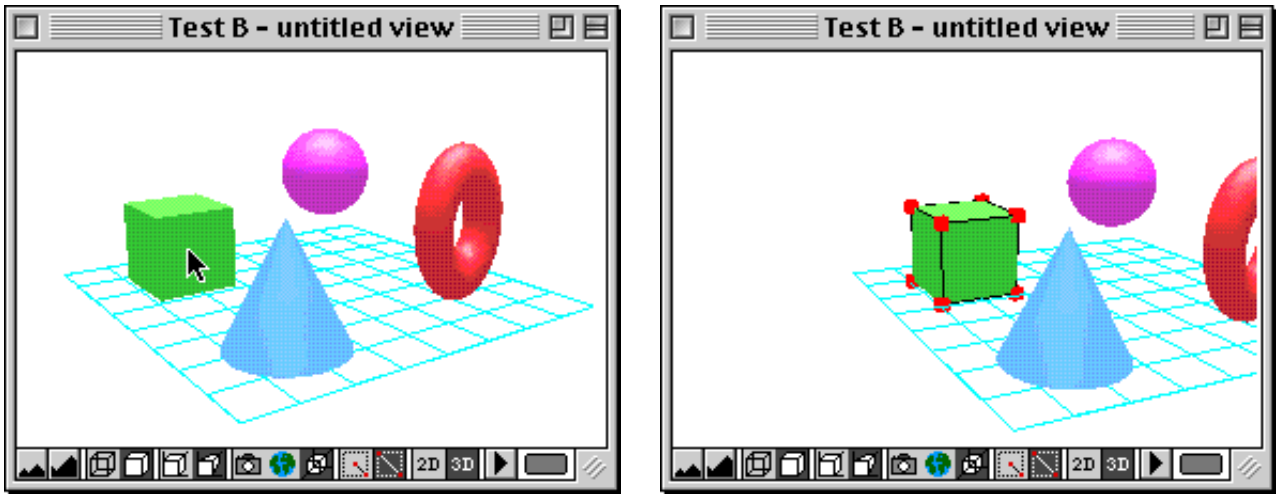
## ◆ Inches

Select this option to use inches or feet as units of measurement. The grid size, position coordinates and dimensions will all be calculated using inches or feet.

## ◆ Auto Look At

Allows you to easily change the document view to display a selected object or point in the center of the view.

Select Auto Look At, then move the cursor to the area you wish to view and click the mouse. The view will change to reflect your actions:

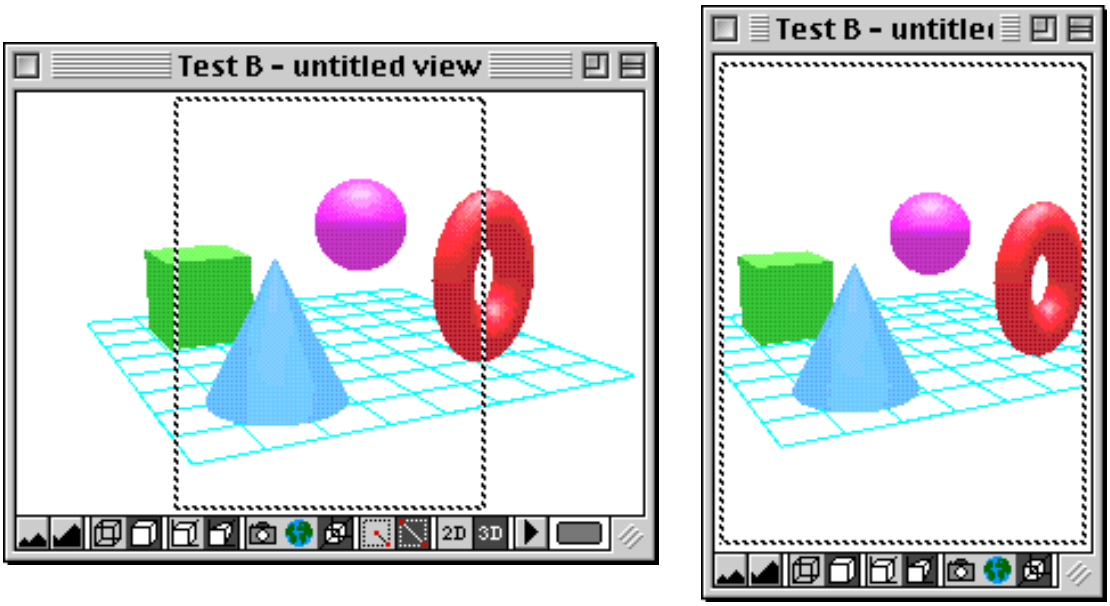



Reselect this option to disable it.

## ◆ Constrain To Page Setup

Constrains the window to the proportions of the page size selected in the Page Setup dialog. Select this option and a dotted outline representing the page appears in the center of the win-

dow. Change the window size via the Window Zoom Box or Window Resize Box and the window will be constrained to the page proportions. Reselect the option to remove the constraint.




## ◆ Animation On

Allows you to turn animation on and off for the current document. Select the item from the menu: animation will be turned on and a checkmark will appear by the item name. To turn animation off: select the menu item again. Animation can also be turned on and off using the Animation Player or Animation Tweener palette. *See Animation Player on page D-12 and Animation Tweener on page D-17 for further details.*

## ◆ Spin Around Look At

Select Spin around Look At to rotate a view around the point at the center of the view. Click anywhere in the window to stop the rotation.

## PALETTES MENU

Click on Palettes in the application menu bar to display a list of available palettes. Select the palette name from the list to open it.

The Tools, Info and Help palettes are the standard palettes included in the application. All other palettes are plug-in palettes that can be loaded when the application is launched or while it is running.

*See Chapter 4 — Palettes on page 4-1 for details of the Tools, Info and Help palettes, Appendix D — Plug-in Palettes on page D-1 for details of plug-in palettes, and Installing Plug-ins on page 1-6 for details of installing plug-ins.*

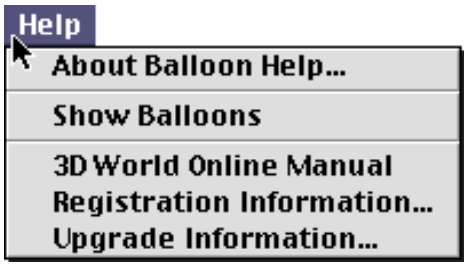
## PLUG-IN MENU

Click on the Plug-in icon in the application menu bar to display a list of available plug-ins.

Select the plug-in name from the list to open it.

*See Appendix C — Menu Command Plug-ins on page C-1 for details of plug-ins accessed from the plug-ins menu.*

## HELP MENU




### ◆ About Balloon Help

Select this option to display information about Balloon Help.

### ◆ Show/Hide Balloons

Select Show Balloons to display Balloon Help messages. When Show Balloons has been selected, this menu item changes to Hide Balloons. Select Hide Balloons to stop displaying the Balloon Help information.

### ◆ Online Manual

Select this option to launch Acrobat Reader (if available) and display the Online manual.

## ◆ Registration Information

Select Registration Information to register your product via the Microspot web page. The Register Information dialog displays:

Click on the Connect button in the dialog to go to the web page or alternatively, register your product by filling in and returning the registration card included in the product box.

## ◆ Upgrade Information

Select Upgrade Information to obtain product upgrade information (if any) from the Microspot web page. The Upgrade Information dialog displays:

Click on the Connect button in the dialog to go to the web page or alternatively, contact Microspot via telephone, fax or email for upgrade information.

# Chapter 4

# Palettes

The Tools, Info and Help palettes are the standard palettes included in the application. All other palettes are plug-in palettes that can be loaded when the application is launched or while it is running. *See Installing Plug-ins on page 1-6 for further details.*

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## INTRODUCTION

To open a palette, select its name from the Palettes menu. The Palettes menu lists of all the available palettes.

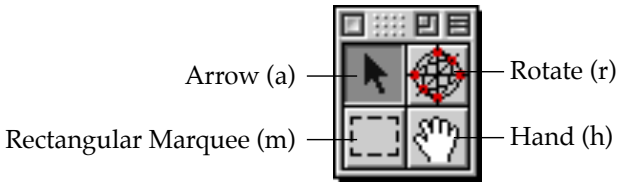
The Tools palette displays automatically the first time the application is launched. The status and position of all palettes is remembered each time the application is opened. To return palettes and preferences to their default settings, hold down the Command and Option keys while launching the application. Close a palette by clicking on the top left corner of the palette window.

Window controls are displayed at the bottom of each document window and these are also discussed in this section of the manual.

**Note:** If any palette is moved to within 5 pixels of the edge of the screen, the palette will snap to the edge of the screen.

## TOOLS PALETTE

The tools built-in to the application Tools palette are the Arrow, Rotate, Rectangular Marquee and Hand tools.




The rest of the tools are plug-ins that can be loaded when the application is launched or while it is running. *See Installing Plug-ins on page 1-6 for further details.*

Select the tool to use by clicking on its icon in the Tools palette. After a tool has been used, the currently selected tool reverts to being the Arrow tool, unless the default tool is changed in the Preferences dialog. *See Preferences on page 3-24 for further details.* You can, however, double-click on any tool to lock it in so that it will not change after you use it, but will remain selected.

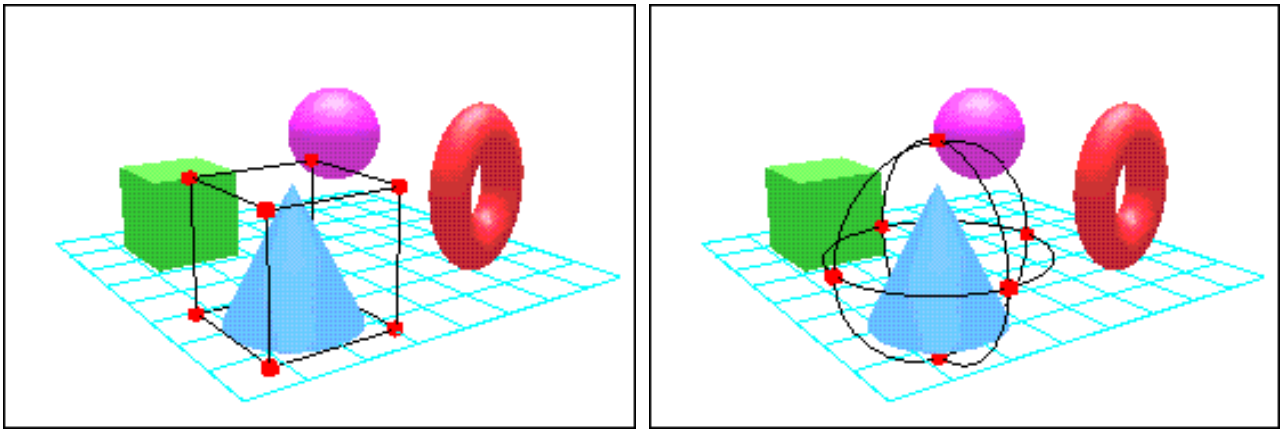
### ◆ Select/Move

Both the Arrow and Rotation tools can be used for selecting and moving objects. You can also click and drag on the grid with either tool to move the entire scene in the window. *See Manipulating The Grid on page 4-10 for further details.*

**Note:** Objects may be locked to prevent them being moved or rotated in one or more directions, or to prevent them being resized. *See Lock Position on page 4-17, Lock Size on page 4-17, Lock Rotation on page 4-18 and Lock on page 4-19 for more details.*

#### Select

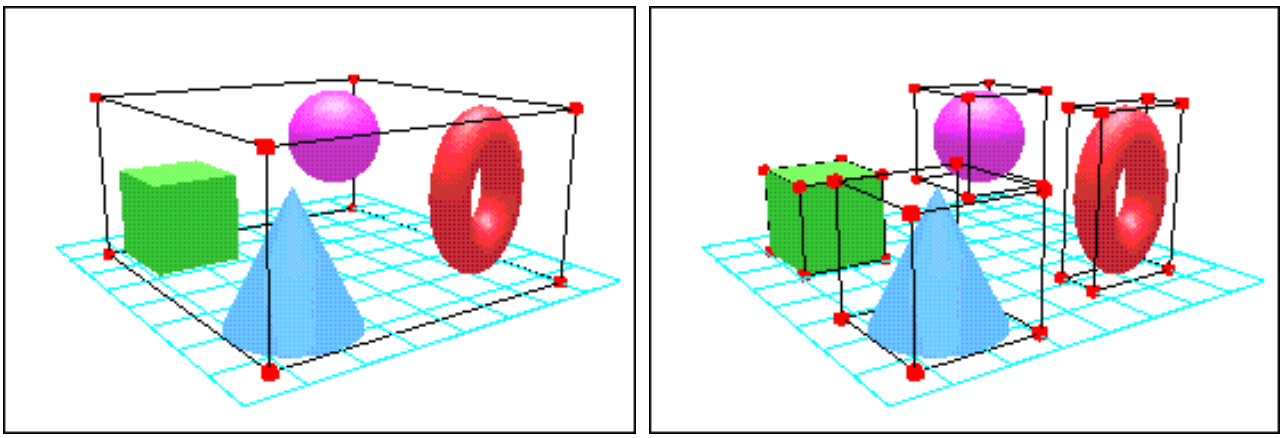
When an object is selected, it is surrounded by a bounding frame with handles at the points where the bounding lines intersect:



To temporarily hide an object's bounding frame, hold down the Option key and click on the arrow or rotate tool. The item is still selected, but the bounding frame and handles do not display. To re-display, click on the arrow or rotate tool again.

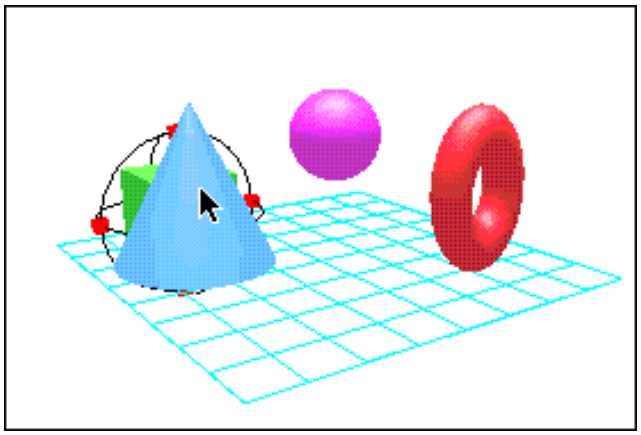
To add objects to a selection, hold down the Shift key and click on the additional objects. To deselect one object in a selection, hold down the Shift key and click on the object. If you click on an object that is part of a group, the entire group will be selected and the bounding frame will surround all of the items in the group.

Double-click on a group of objects to open a new window in which the grouped items can be edited:



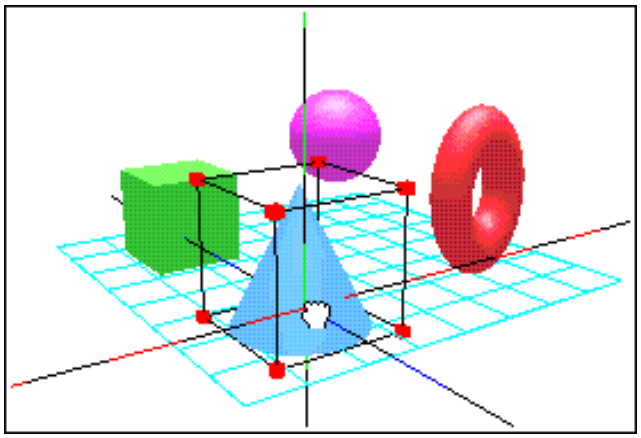
When you close this editing window, any changes you have made will be reflected in the original document window. You can also edit a group by selecting it and choosing Edit Item from the Options menu. *See Edit Item on page 3-34 for further details.*

Hold down the Command key and click the mouse to select an object that is behind another object. Initially, the foremost object will be selected. The second time you click the mouse, the next object back will be selected, and so on:



**Move**

To move an object, click on it, hold down the mouse button, and drag. Release the mouse button to place the object in its new location. Hold down the Control key and drag up or down to move the object closer or further away. If you hold down the Shift key, lines will display showing the X, Y and Z axes, and movement will be constrained to these axes:



Objects can also be moved by entering coordinate values in the Info Palette. *See Position on page 4-16 for further details.*

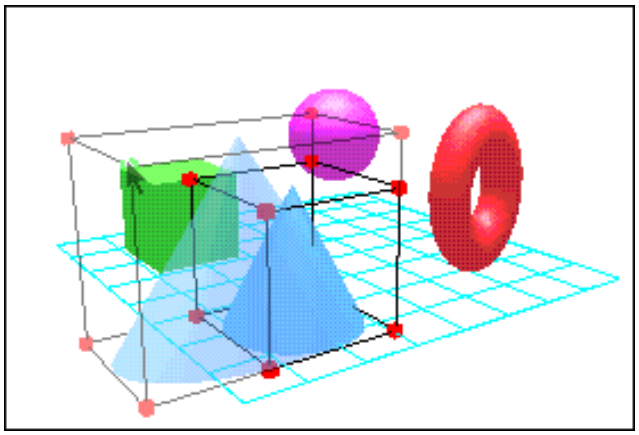
## Select/Move/Scale

**Note:** Objects may be locked to prevent them being moved or rotated in one or more directions, or to prevent them being resized. *See Lock Position on page 4-17, Lock Size on page 4-17, Lock Rotation on page 4-18 and Lock on page 4-19 for more details.*

Select an object with the Arrow tool, it will display surrounded by a bounding frame with handles at the corners.

As an alternative to clicking and dragging, you can move an object using the arrow keys by selecting the object and pressing the desired arrow key to move it one pixel. If you hold down the arrow key, the object will move one pixel at a time until it has moved six pixels. It will then begin to move at an accelerated rate. To move objects closer or further away, hold down the Control key while using the up and down arrow keys.

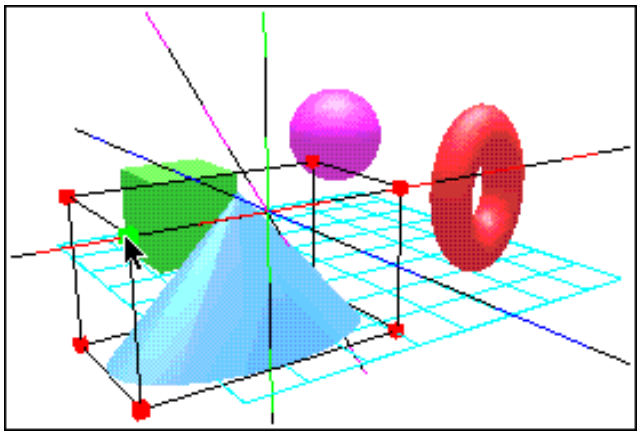
To change the size of an object, move the cursor over one of the handles of the bounding frame. When the cursor changes to a white arrow, click the mouse and drag. The shape or size of the object will change to reflect your actions:



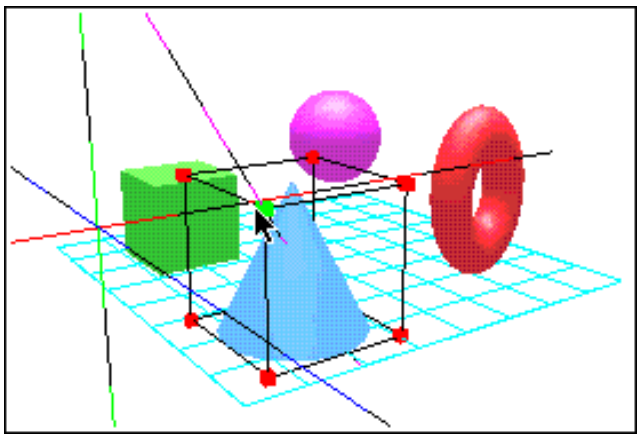
**Note:** If the Advanced Handles preference is checked on in the Preferences dialog, the lines of the bounding frame of an object can also be clicked on and dragged to resize the object. *See Preferences on page 3-24 for further details.*

Hold down the Shift key when resizing an object to constrain movement to the X, Y, or Z axes or to maintain the objects proportions. Four constraining lines are displayed. The red line repre-

sents the X-axis; the green line the Y-axis; and the blue line the Z-axis. The pink line represents the line along which the object will retain its current proportions:



If, after resizing the object, you hold down the Option and Shift keys and resize the object a second time, the pink line will move to a position which allows you to constrain the object to the proportions it was originally drawn with:



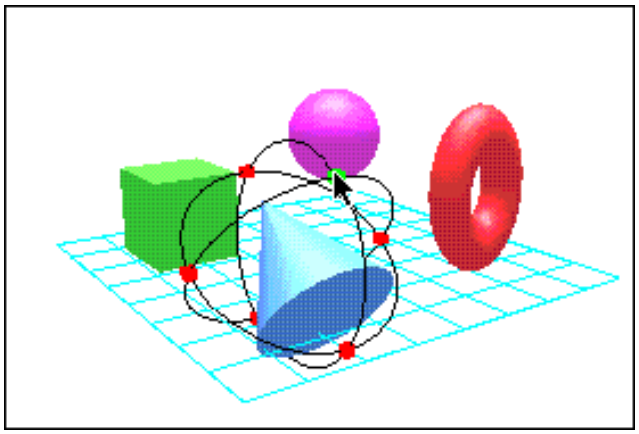
Objects can also be resized via the controls in the Info Palette. *See Size on page 4-17 for further details.*

## Select/Move/Rotate

**Note:** Objects may be locked to prevent them being moved or rotated in one or more directions, or to prevent them being resized. *See Lock Position on page 4-17, Lock Size on page 4-17, Lock Rotation on page 4-18 and Lock on page 4-19 for more details.*

When an object is selected with the Rotate tool, it displays surrounded by a bounding sphere with six handles.

To rotate the object, move the cursor over one of the handles of the bounding frame. When the cursor changes to a white arrow, click the mouse and drag. The object will rotate to reflect your actions:



**Note:** If the Advanced Handles preference is checked on in the Preferences dialog, the lines of the bounding frame of an object can also be clicked on and dragged to rotate the object. *See Preferences on page 3-24 for further details.*

**Note:** holding down the Shift key while rotating an object constrains the rotation to 90°.

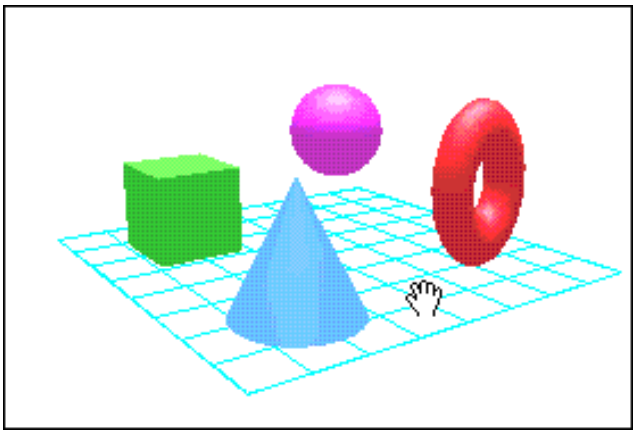
You can also use the arrow keys to rotate objects. If you hold down the arrow key, the object will rotate in 1° increments for 6°, then accelerate to 10° steps. If you hold down the Shift key while using the arrow keys, you can rotate objects in 45° increments. To tilt an object, hold down the Control key and use the left and right arrow keys.

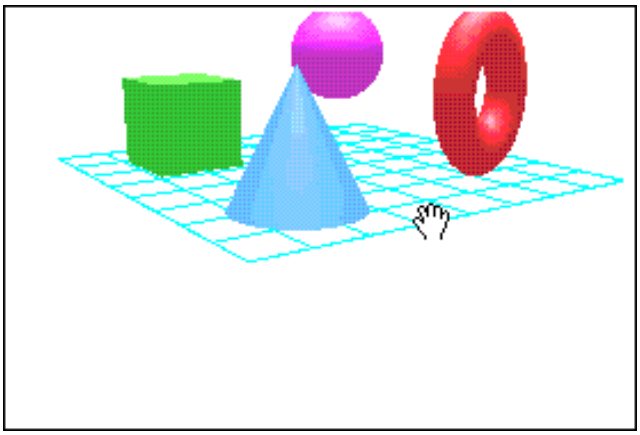
## Manipulating The Grid

The Arrow and Rotate tools can be used to move and rotate the grid, as well as objects, to easily manipulate your view of a document.

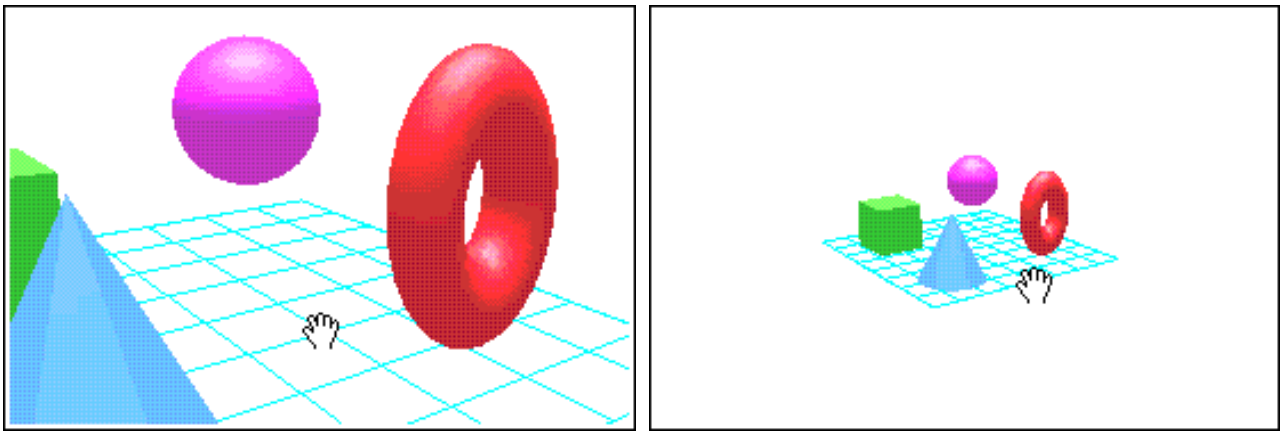
### Moving The Grid

Select the Arrow tool and move the cursor over the grid. Hold down the mouse button, the cursor changes to an open hand. Move the cursor up, down, left or right. The grid will move to reflect your actions:

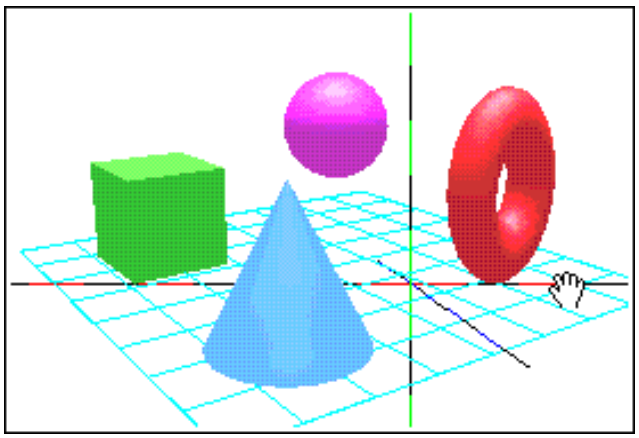




Hold down the Control key and move the mouse up and down to move the grid closer and further away:

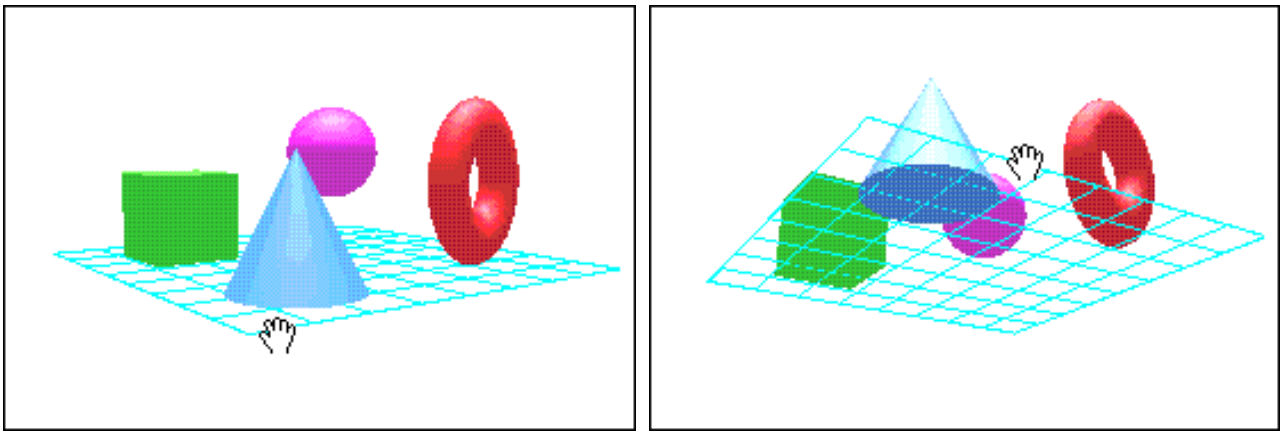


Hold down the Shift key when moving the grid to display, and constrain movement to, the X, Y and Z axes:

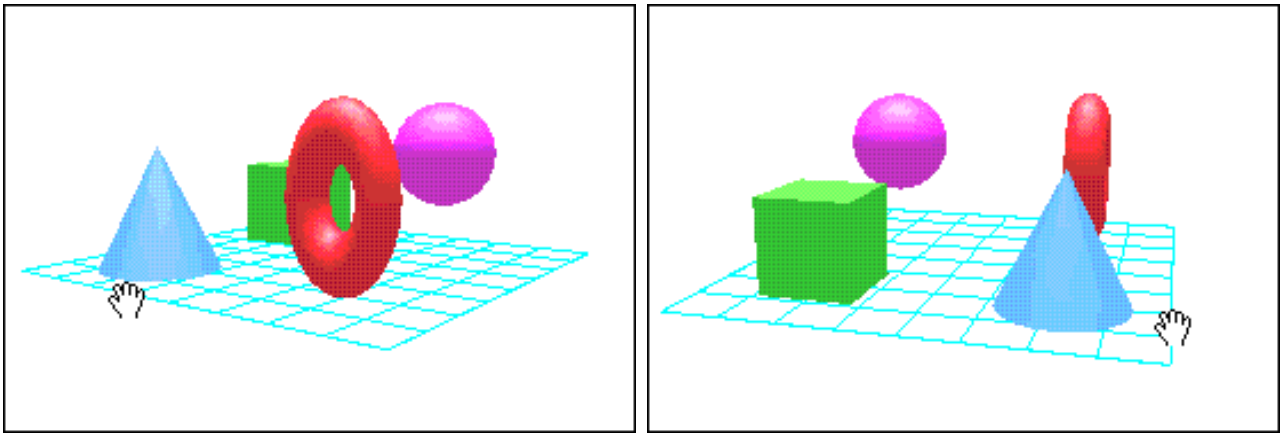


### Rotating The Grid

Select the Rotate tool and move the cursor over the grid. Hold down the mouse button, the cursor changes to an open hand. Move the mouse up, down, left or right. The grid moves to reflect your actions:



Hold down the Shift key while rotating the grid to constrain it to its initial plane. It can then only be rotated in that plane:

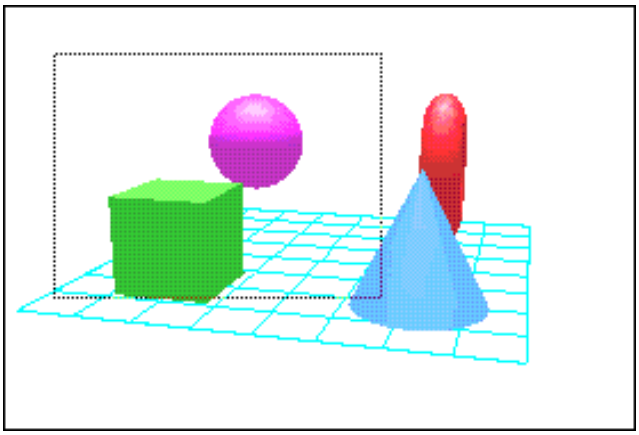


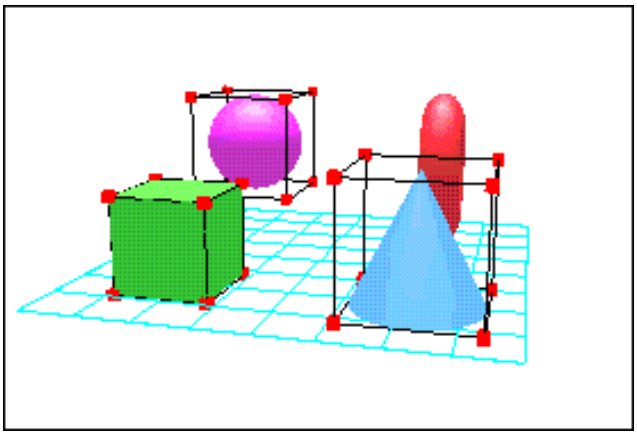
Holding the command key down before grabbing the grid will allow you to switch between rotating or moving the grid.

The arrow keys can be used to move and rotate the grid when nothing is selected in the document window. The grid will either move or rotate depending on which tool is currently selected. Use the control key to move in the Z dimension.

## Rectangular Marquee

Select the Rectangular Marquee tool, hold down the mouse and drag out a rectangle to select one or several objects. (Note that if any part of an object is inside the marquee, that object will also be selected.)

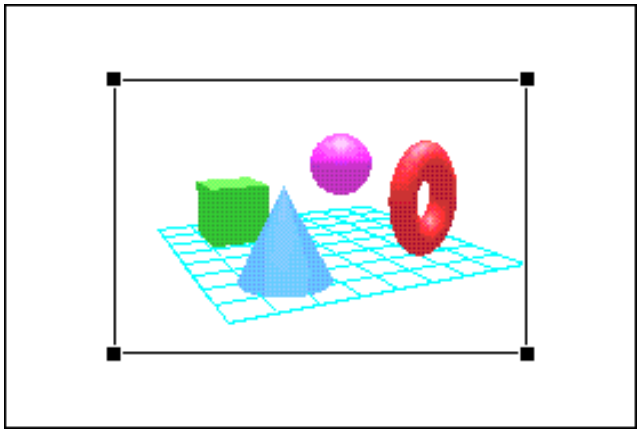




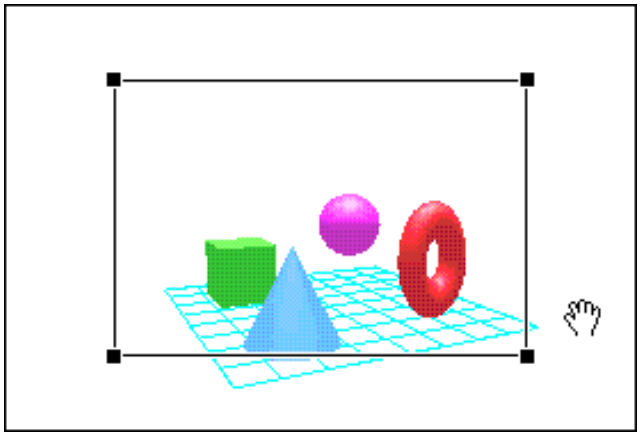
To add objects to a selection, hold down the Shift key and drag a rectangle around the desired objects. To deselect items, hold down the Shift key and drag a rectangle around selected items. You can also add or remove items from a selection by clicking on them with the Arrow tool while holding down the Shift key.

## Hand

Use the Hand tool to change the view of the document by altering the position of the camera. When you select the Hand tool, a frame will appear around the contents of the window. A handle will also appear at each corner of the frame:



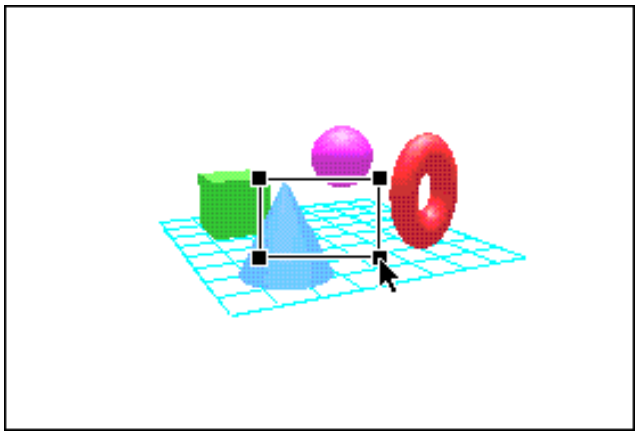
You can either position the view within the frame, or position the frame around the view. To position the view, click outside the frame and drag the mouse. To position the frame, click inside the frame and drag the mouse:



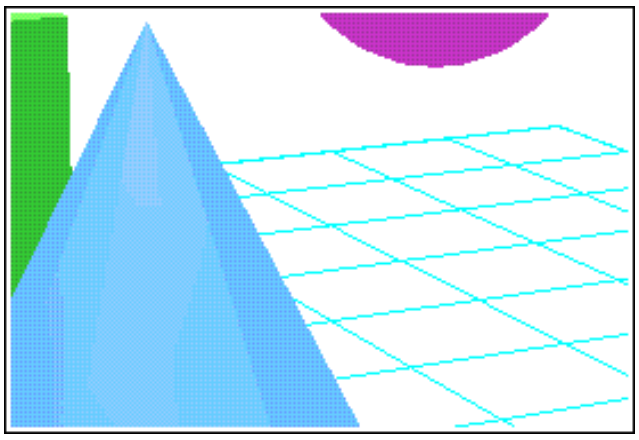
If you are in an elevation or orthogonal view, move the mouse left and right to crab, or up and down to change the camera height.

If you are in a perspective or user defined view, move the mouse left and right to pan the camera, or up and down to tilt the camera. Hold down the Option key and move left and right to crab, up and down to change the height.

To zoom in on an object (note that you are not actually moving the camera, but rather narrowing the focus), click on one of the frame handles and drag it in towards the center of the window:



When you select another tool, the window changes to show the view you have chosen:

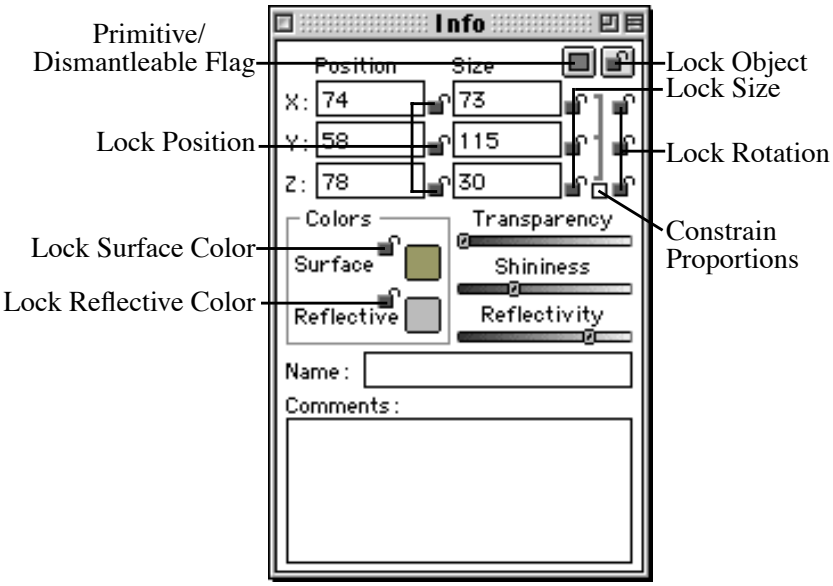


## INFO PALETTE

The Info palette displays information about, and provides controls for you to adjust, the characteristics of a selected object or light.

Select Info from the Palettes menu to display the Info Palette. When it is first opened, only the top section of the Info palette will be visible. To extend the palette and display the Comments section at the bottom, click on the button on the left in the top right corner of the palette. To reduce the window, click again.

**Note:** The controls in the Info Palette will vary depending on whether you have selected a 3D object or a spot/point light in the document window:




### ◆ Position

The figures displayed in the X,Y and Z Position boxes are the grid coordinates of the center of the selected object's bounding rectangle. If you select items that are grouped together, the coordinates displayed will relate to the group. If you select more than one item and the items are not grouped, no coordinates will display.

To precisely position an object, type in values for the X, Y and Z coordinates, then press Enter. The object will move to reflect your entries.

#### Lock Position

The padlocks next to the position boxes are used to lock the position of an object. The lock options work the same for groups of objects as for single objects.

Click on the padlock next to the X position coordinate. It will close, which means the object is in a fixed position on the X axis (in relation to the grid), but can still be moved in the Y and Z axes. Any or all coordinates can be constrained. If an object's position is constrained on all three axes, it cannot be moved. However, you can still change the object's size (unless it has also been constrained).

## ◆ Size

The size boxes display the X,Y and Z dimensions of an object's bounding rectangle. If you select items that are grouped together, the dimensions displayed will relate to the group's bounding rectangle. If you select more than one item and the items are not grouped, no dimensions will display. To precisely resize an object, type in values for the X, Y and Z dimensions, then press Enter. The object will be resized to reflect your entries.

**Note:** Information about the object's size will be grayed out if you have selected a light as light objects have a constant size which cannot be changed.

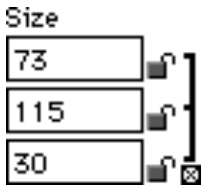
#### Lock Size

The padlocks next to the size boxes are used to lock the size of an object. The lock options work the same for groups of objects as for single objects.

Click on the padlocks by the size dimensions to constrain an object's size. Click on a closed padlock to open it and unconstrain an object's size. Any or all size dimensions can be constrained. If all are constrained, the size cannot be changed. If just one dimension is constrained, you can change the other dimensions.

#### Constrain Proportions

The Proportional Constrain checkbox to the bottom right of the dimension fields allows you to constrain the proportions of an object. Select an item and click on the checkbox to turn on Proportional Constrain.




The item can now be resized or moved, but will always maintain its current proportions.

## ◆ Rotation

#### Lock Rotation

To the right of the size controls are additional padlocks for the X, Y, and Z axes that are used to constrain the rotation of an object.

Click on the padlock relating to the X axis. It will close, indicating that the object cannot be rotated around the X axis (in relation to the grid), although it can still be rotated in the Y and Z axes. The rotation of the object can be constrained in any or all of the axes. The X Y and Z axes are determined by the orientation of the object.

## ◆ Primitive/Dismantleable Flag

This option is only available when an item or group is selected. A Primitive item cannot be ungrouped into component items. Click on the button to toggle between Primitive and Dismantleable. The solid square button represents the Primitive state and the split button the Dismantleable state. An object can also be specified to be Primitive or Dismantleable by selecting

Primitive or Dismantleable from the Options menu. *See Primitive on page 3-36 and Dismantleable on page 3-37 for further details.*

## Lock

To lock a selected object or group of objects, click on the padlock icon in the top right corner of the Info palette, or select Lock from the Options menu. *See Lock on page 3-36 for further details.* This will prevent the object or group from being moved or changed. To unlock an object, click on the Padlock icon a second time, or select Unlock from the Options menu. *See Unlock on page 3-36 for further details.*

## Colors

### Surface

The Surface color box shows the color of the selected object.

To change the color of the object, click on the Surface color box to display the Color Picker. Select a color and close the dialog. The color you have chosen will be displayed as the Surface color and applied to the selected object. If a light is selected the Surface color is the color of the light emitted, rather than the color of the light marker, which is set in the Preferences dialog. *See Color Preferences on page 3-24 for further details.* Colors can also be dragged and dropped onto the Surface color box from the Default Color block at the bottom of the document window, from the Reflective color box, the Color Palette etc.

#### Lock Surface Color

The padlock next to the Surface color box is used to protect the surface color of the object from being changed.

### Reflective

The Reflective color box shows the reflective color of the selected object. If light is shining on an object (sun light or spot/point lights), the part of the object that shines displays the reflective

color. This will only be visible if you have selected the Best Shading option for the interactive renderer, or the Microspot Renderer via the Renderer Options palette. *See Renderer Options on page D-77 for more details.* This option is not available for lights.

To change the Reflective color of the object, click on the Reflective color box to display the Color Picker. Select a color and close the dialog. The color you have chosen will be displayed in the Reflective color box. Colors can also be dragged and dropped onto the Reflective color box from the Default Color block at the bottom of the document window, from the Reflective color box, the Color Palette etc.

#### Lock Reflective Color

The padlock next to the Reflective color box is used to protect the surface color of the object from being changed.

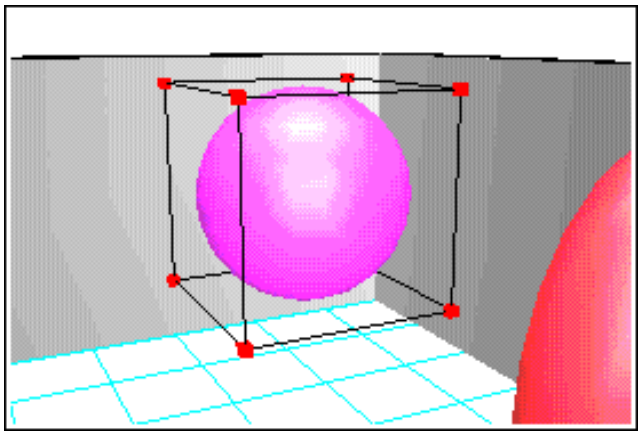
## ◆ Transparency/Brightness

#### Transparency

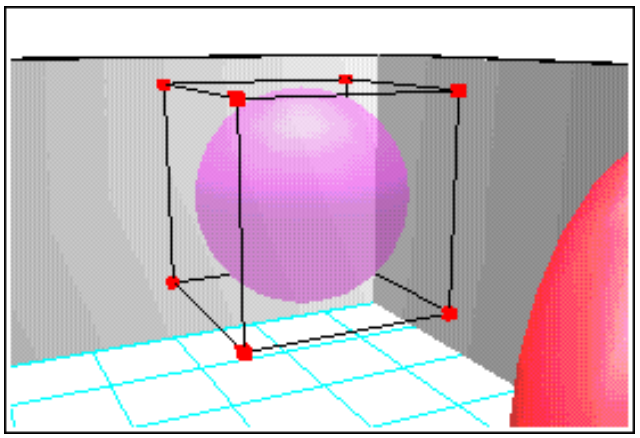
If an object is selected, the first slider control relates to its transparency. Transparent surfaces are not activated unless you have a QuickDraw 3D hardware renderer installed or are using a software plug-in renderer that supports transparency. If transparency is applied to an object which is subsequently transferred to a machine with the necessary hardware or software, the object's transparency will become apparent.

Select an object and use the Transparency slider control to adjust its transparency.

• When the transparency slider is to the left of the bar, the selected object is opaque:

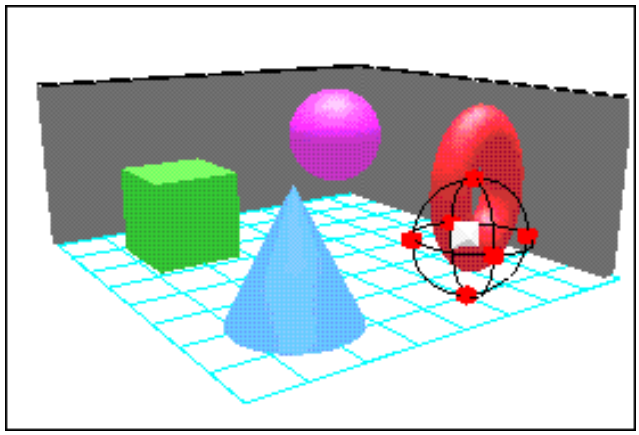


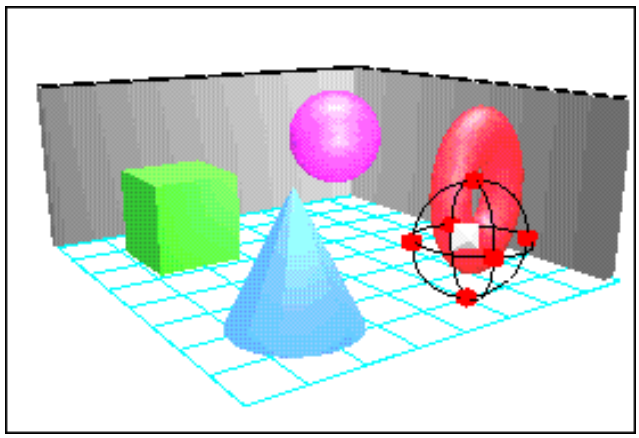
As the slider is moved along the bar, the object becomes more transparent:



### Brightness

If a light is selected, the first slider control relates to the brightness of the light it emits:

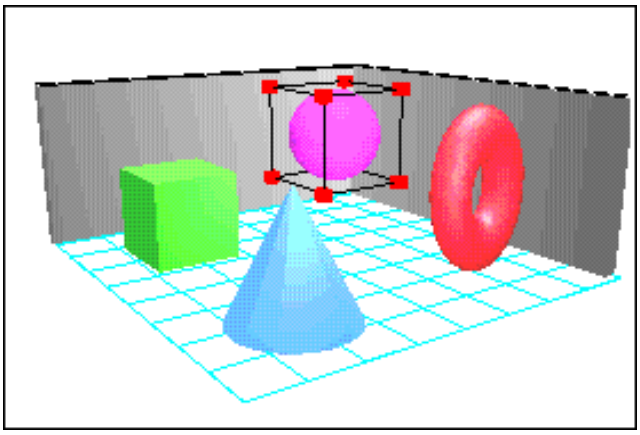


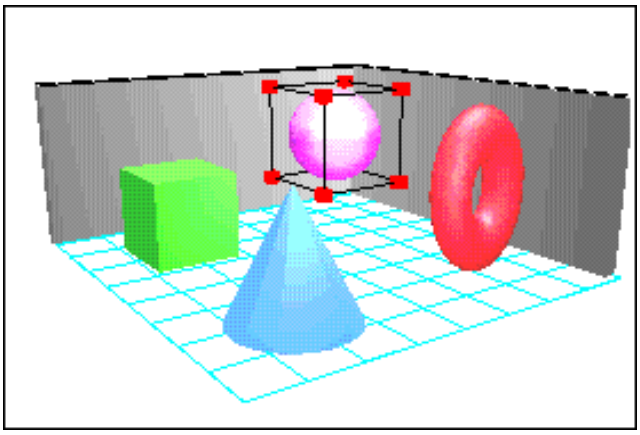


## ◆ Shininess/Spread

### Shininess

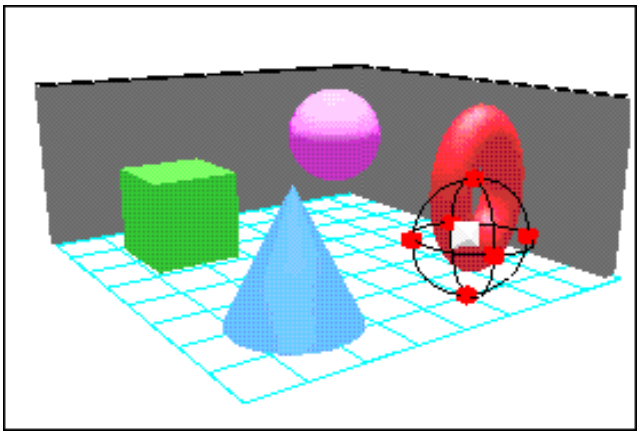
If an object is selected, the second slider control relates to its shininess. Use the slider control to adjust the degree of shine you place on an object. Shine is affected by directional light such as sun light or spot/point lights:

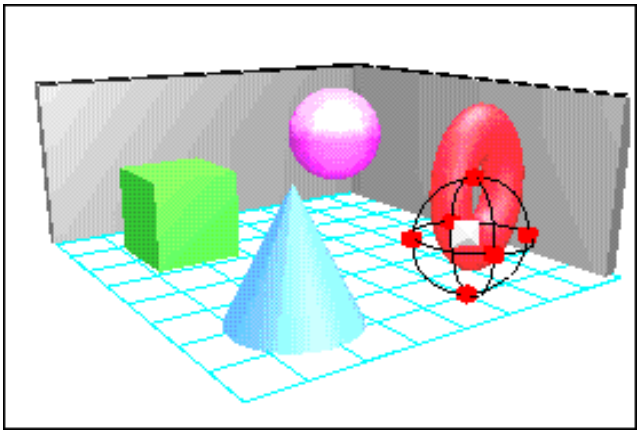




### Spread

If a spot light is selected, the second slider control allows you to adjust the lens angle of the light and narrow or widen the beam. Note that this option is not available for point lights:

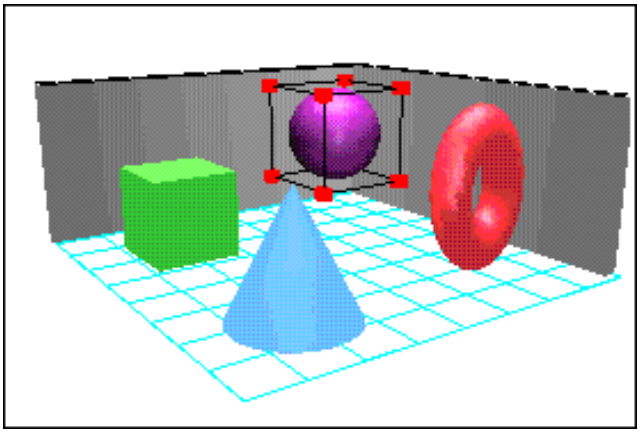


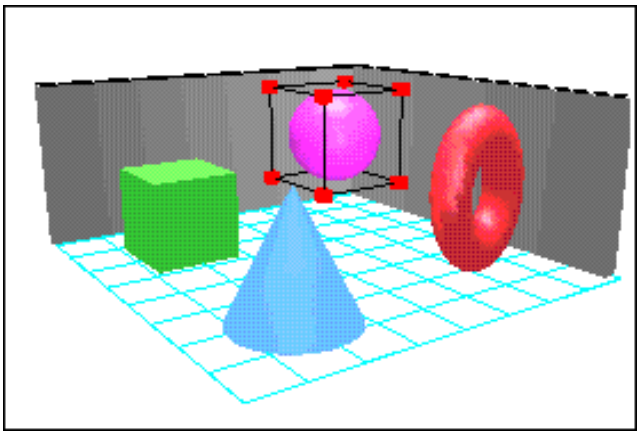


## ◆ Reflectivity/Sharpness

### Reflectivity

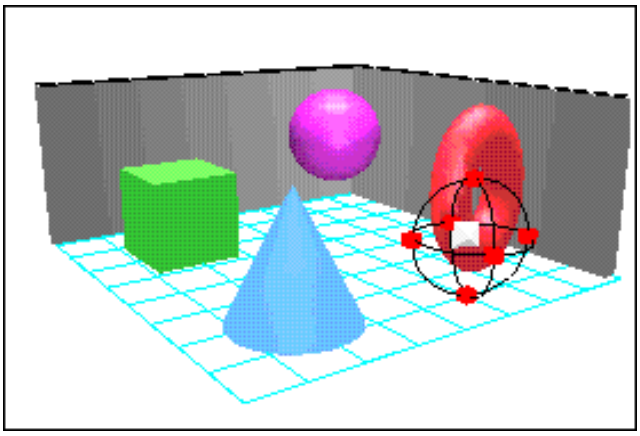
If an object is selected, the third slider control allows you to adjust its reflectivity, which is the amount of ambient light the object reflects:

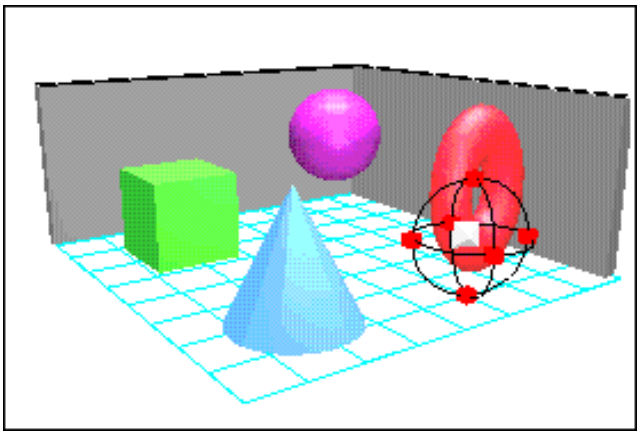




### Sharpness

If a spot light is selected, the third slider control allows you to adjust the sharpness of the light. Move the slider control to sharpen or unsharpen the focus of the light. Note that this option is not available for point lights:





## ◆ Name

The Name box provides a space to enter a name for an object or group of objects. This name will be displayed whenever the object or group is selected.

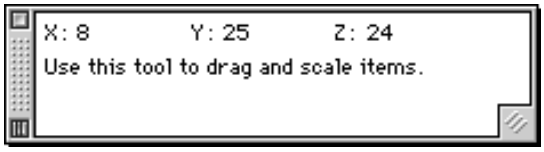
## Comments

The Comments box provides a space to enter details about an object or group of objects (such as a description). These comments will be displayed whenever the object or group is selected.

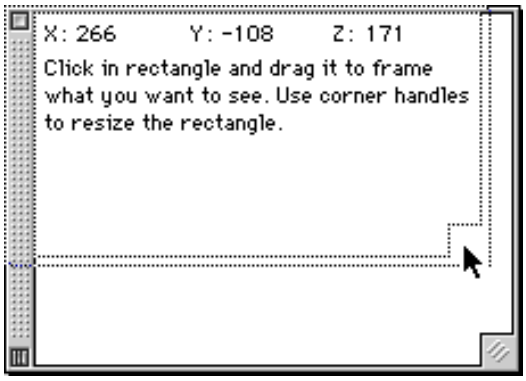
## THE HELP PALETTE

The Help palette displays coordinate values that show the position of the cursor and help messages or information relevant to the tool selected, cursor position or rendering status (if a non-interactive renderer is being used).

Select Help from the Palettes menu to display the Help palette:




To resize the Help palette, click on the resize box in the bottom right corner of the palette and, holding down the mouse button, drag to resize the palette. Release the mouse button when the palette reaches the desired size.



## WINDOW CONTROLS

The Window controls are displayed at the bottom of each window:

Selecting an option affects only that window, regardless of how many other views are open.

### ◆ Zoom Out

Use the Zoom Out button to widen the focus of the camera's view and make objects appear to be farther away. Position the cursor over the Zoom Out icon and click once to zoom out slightly. Click and hold the mouse button down to continue zooming out.

### ◆ Zoom In

Use the Zoom In button to narrow the focus of the camera's view and make objects appear to be closer. Position the cursor over the icon and click once to zoom in slightly. Click and hold the mouse button down to continue zooming in.

### ◆ Wire Frame

Select this option to view objects in wire frame mode. Working in this mode is usually faster than working in solid fill mode as there is less information to be updated after each change.

## ◆ Solid Fill

When the Solid Fill option is selected, objects are displayed with filled surfaces. Although working in this mode may be slower than working in wire frame mode, it offers a better representation of your 3D models.

## ◆ Orthographic

Select the Orthographic option to see an orthogonal view of the document rather than a perspective view. In an orthogonal view, all parallel lines display as parallel.

## ◆ Perspective

Select the Perspective option to see a perspective view of the document rather than an orthogonal view. In a perspective view, parallel lines converge. If extended, they would converge at a point (the vanishing point).

## ◆ Coordinate Systems

Select the Camera, World or Object icon to specify a coordinate system. The system you choose will affect the way new objects are drawn and existing objects are manipulated. Since the bounding rectangle of a shape is drawn according to the coordinate system, changing the

shape or size of the bounding rectangle will have different effects on the object when using the different coordinate systems.

The grid is drawn according to the World Coordinate System. Holding down the Shift key constrains movement to the X, Y or Z axes. When moving or resizing an object, holding down the Shift key makes the axes visible. The X-axis is red and runs left to right; the Y-axis is green and runs top to bottom; and the Z-axis is blue and runs in/out. These constraining lines will be in different positions depending upon which coordinate system is being used.

**Camera Coordinates**

When this option is selected, the X, Y and Z axes relate to the direction and angle of the camera. New objects will be drawn perpendicular to the camera. Object manipulations can be constrained to the axes that relate to the camera.

**World Coordinates**

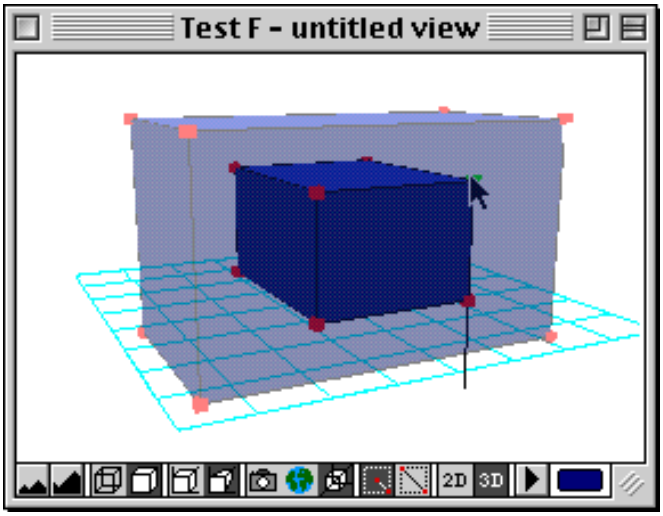
When this option is chosen, the X, Y and Z axes relate to the World Coordinates and are the same as the grid axes. New objects will be drawn in relation to the World Coordinate X,Y and Z axes. Manipulated objects can be constrained to these axes.

**Object Coordinates**

This is the default option. When the Object Coordinates option is chosen, the X, Y and Z axes relate to the orientation of a selected object.

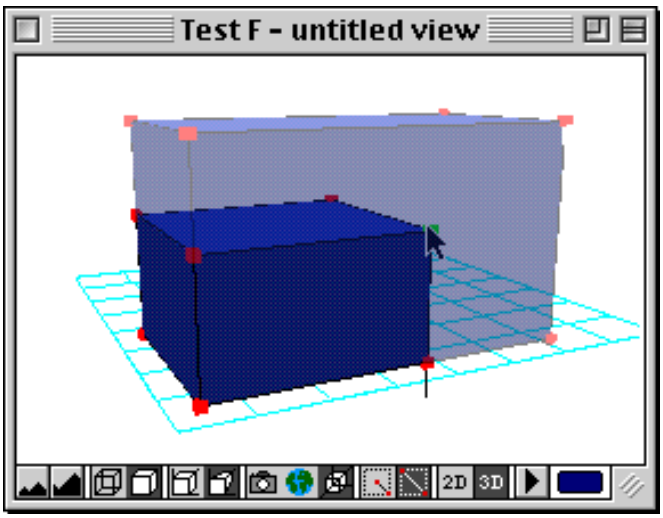
## ◆ Radius

If Radius mode is selected, objects are drawn from a central point. This is the point at which you first placed the cursor to start drawing an object. When resizing an object, the center of the object will remain in a fixed position:




## Diameter

This is the default mode. When selected, objects are drawn from the point where you initially placed the cursor and began to draw. When resizing an object, the corner opposite the one you are dragging will remain in a fixed position:



## ◆ 2D

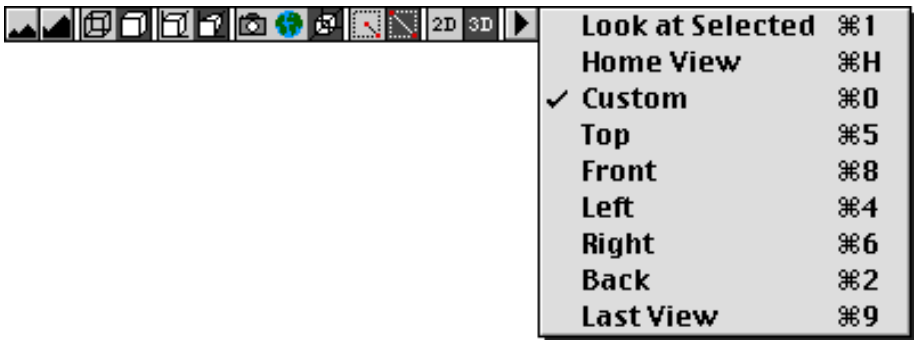
If 2D Mode is selected, objects can only be drawn in 2D. An object will normally be drawn in the X,Y plane, however if you begin drawing while holding down the Control key, the object will be drawn in the X,Z plane. If you release the Control key while continuing to hold down the mouse button, the object can be flipped into the Y,Z plane. Once drawn, the object will be constrained from resizing in the smallest axis until the constrain locked flag is turned off in the Info Palette. *See Lock on page 4-19 for further details.*

## ◆ 3D

This is the default mode which allows you to draw objects in 3D. Hold down the Control key and move the mouse up and down to move in and out in the document space.

## View

Use the View popup menu to select a different view, including any view that you have saved. When you select a view option, the window will change to display your selection:

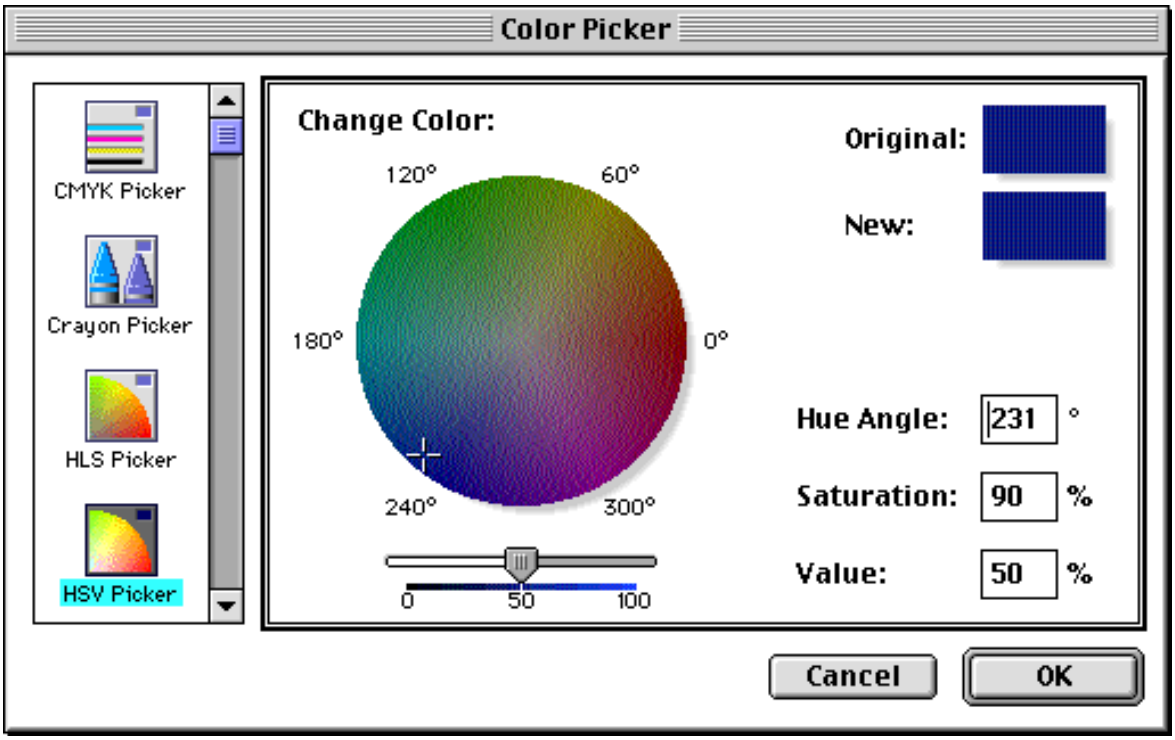



The Command key options and View menu can also be used to choose a view. *See Change View on page 3-31 for further details.*

## Default Color

The color displayed in the color block at the bottom right of the window toolbar is the currently selected color. Any new items created (except lights and markers) will automatically be this color, even if you are working in wire frame mode.

To change the default color, click on the color block and select a new color from the Color Picker:




To change an object's color, click on the color block and drag the color over the object. It will be highlighted by a bounding frame to show that it is selected. Release the mouse button to apply the color to the object. You can also select an object, then go to the Color Picker and select a new color to automatically apply that color.

## ◆ Window Resize

To change the size of the window you are working in, click on the Resize Window icon. Hold down the mouse and drag to resize the window.

# *Appendix A*

# *Import Plug-ins*

Import plug-ins are accessed via the Import submenu in the File menu.

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## Introduction

Open the File menu and select Import. A submenu lists the installed Import plug-ins:

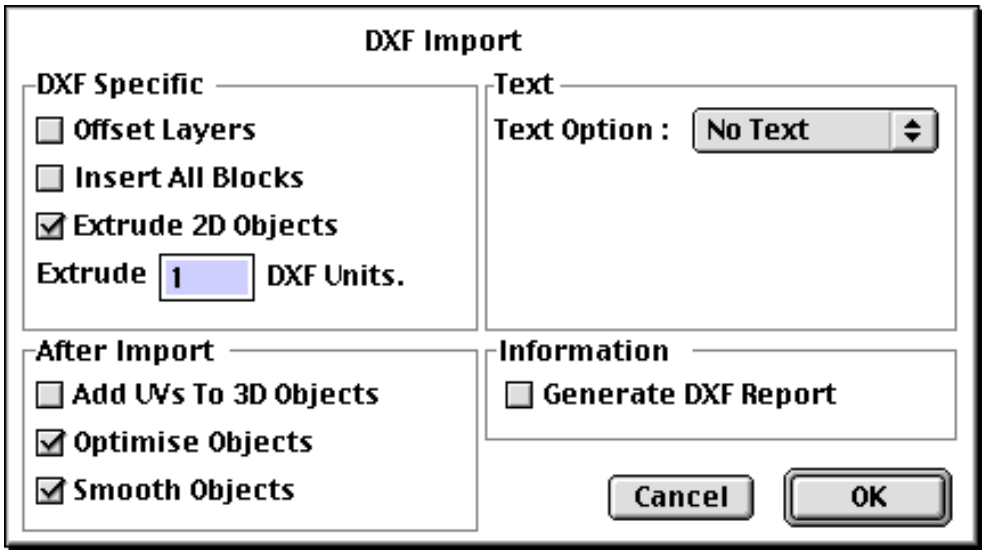
The 3DMF Import option is not a plug-in but part of the core application. *See 3DMF on page 3-9 for more details.*

Select the option to use from the list.

## ◆ DXF

The DXF plug-in is used to import a DXF file into a 3D World document as 3DMF. DXF (Data Exchange Format) is a standard format used by many CAD and 3D applications.

1. Select DXF from the Import submenu to display the DXF Import Options dialog:




**Note:** the Extrude *n* DXF Units field only displays when the Make 2D Objects Extrudable checkbox is checked on.

2. Set the import options as required:

### DXF Specific

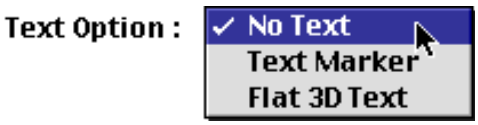
**Offset Layers:** When importing a DXF file composed of layers of information, layers are imported offset from one another.

**Insert All Blocks:** DXF files contain two sections, a section where geometries (blocks) are defined and a section where insertion instructions are held. In some DXF files, blocks may be defined, but never inserted. In this case, click on the Insert All Blocks checkbox to ensure that all blocks defined are imported into 3D World.

**Extrude 2D Objects:** Specify that 2D objects in the DXF file be imported with some depth. Enter a value in the Extrude *n* DXF Units field to set the depth.

### Text

Select an option from the Text Options popup menu to specify how text should be imported:




**No Text:** No text is imported into the 3D World document.

**Text Marker:** Text is imported into the 3D World document as text markers. Text markers have a specific location in 3D space, but the text is always displayed perpendicular to the camera.

**Flat 3D Text:** Text is displayed as a PICT image applied to a 2D rectangle.

### After Import

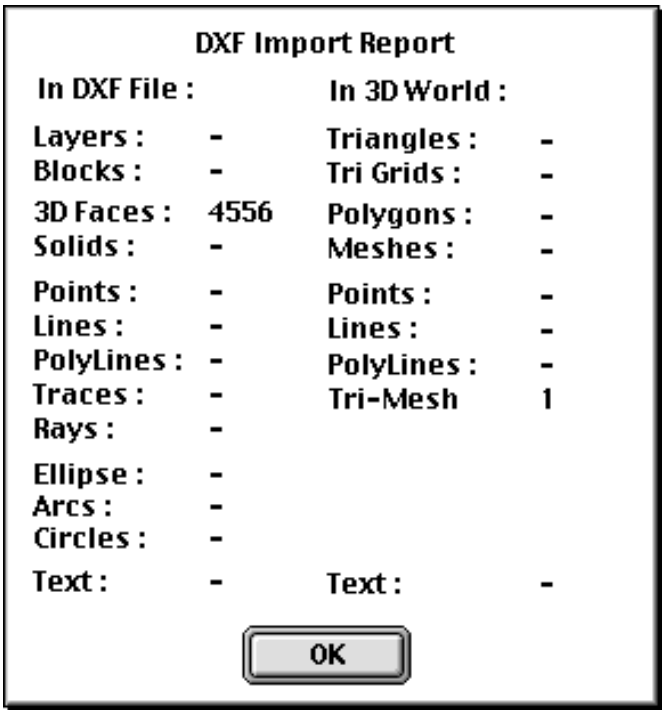
**Add UVs to 3D Objects:** Geometries saved in DXF files do not include UVs (texture hooks). If you plan to apply textures to the items you are importing, click on ADD UVs to 3D objects to add a default set of texture hooks to 3D objects as they are imported. *See Add UV on page H-20 for more details.*

**Optimise Objects:** Click on Optimise Objects to automatically simplify objects as they are imported. Objects will be imported as single trimesh geometries rather than groups of triangles. This will speed up rendering times but the objects cannot be reduced to their component triangles again.

**Smooth Objects:** Objects such as spheres created in 3D World have ‘vertex normals’. These allow an object that is made up of a series of triangles to appear to have a smooth surface. Objects imported into 3D World from a DXF file will not have vertex normals. Click on the Smooth Objects checkbox to improve the appearance of certain objects by adding vertex normals to them.

### Information

**Generate DXF Report:** Request that a DXF report be generated. When the file to import has been selected, the DXF Import Report window will display details of the file:




3. Click OK when you have selected the required options and select the file to import from the standard dialog that displays.
4. The DXF file is imported into the 3D World document as 3DMF.

## ◆ Extrude Bitmap

The Extrude Bitmap plug-in is used to import a 2D PICT, TIFF, JPEG,GIF or Picture clipping file into a 3D World document as a 3D object.

1. Select Extrude Bitmap from the Import submenu in the File menu and choose the file to import from the standard dialog that displays.
2. The selected file will be imported into the 3D World document as a 3D object. Any areas of white in the bitmap will be represented by hollow areas in the resulting 3D object, areas that are not white will appear as solid.
3. To import the file and produce a 3D object with any areas of white in the bitmap appearing as solid, and areas that are not white being hollow, hold down the option key when clicking Open in the standard find file dialog.

## ◆ MacInteriors

The MacInteriors plug-in is used to import a 3D data file from Microspot's MacInteriors application into a 3D World document as 3DMF.

1. Select MacInteriors from the Import submenu and select a MacInteriors file from the standard select file dialog that displays.
2. The MacInteriors file will be converted into 3DMF and placed in the document. All the objects with their descriptions and prices will be imported; library items in the file but not included in the MacInteriors design will not be imported.

## ◆ Relief

The Relief plug-in is used to create a 3D surface from a picture contained in a PICT file, the clipboard or a picture clipping. Each pixel in the source picture is mapped onto a point on the 3D surface, the color of the pixel defining the height of that point.

The Relief tool is an Import plug-in and also a Plug-in Geometry. When selected from the Import submenu, the Relief plug-in uses the settings currently in the Relief Preferences dialog. To change the Relief options, hold down the Option key when selecting Relief from the Import submenu to display the Relief Preferences dialog.

*See Relief on page G-53 for more details.*

## ◆ VRML 1.0 Format

The VRML 1.0 Format plug-in is used to import a file in VRML 1.0 format (Virtual Reality Markup Language) into a 3D World document.

1. Select VRML 1.0 Format from the Import submenu in the file menu and choose the file to import from the standard dialog that displays.
2. The selected file will be imported into the 3D World document as 3DMF.

# *Appendix B*
# *Export Plug-ins*

Export plug-ins are accessed via the Export option in the File menu.

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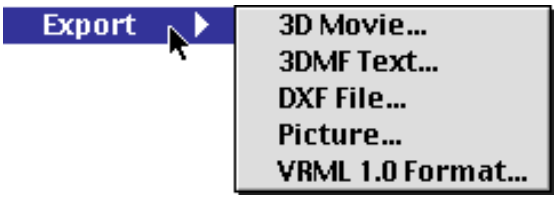
## ◆ Introduction

Open the file menu and select Export. A submenu lists the installed Export options:




The 3DMF Export option is not a plug-in but part of the core application. *See 3DMF on page 3-10 for more details.*

Select the option to use from the list.

## ◆ 3D Movie

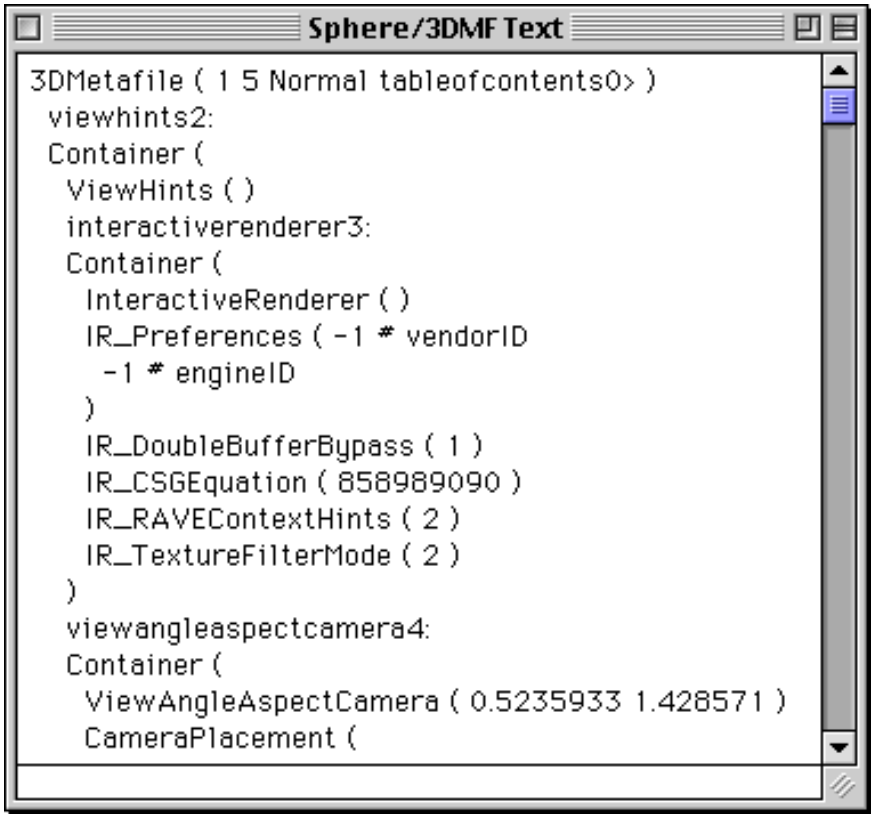
The 3D Movie plug-in saves the current scene as a 3DMF QuickTime movie with a 5 second, 360° rotation. It makes use of the fact that QuickTime 2.5 has a QuickDraw 3D track and a QuickDraw 3D animation track, and will only work if QuickTime 2.5 or later is installed.

1. Select 3D Movie from the Export submenu in the File menu.
2. A standard Save dialog displays. Enter a name and select a location to save the 3D Movie file and click Save.
3. Open the movie file in Movie Player and play the movie. The scene will rotate by 360° over 5 seconds.

## ◆ 3DMF Text

The 3DMF Text plug-in produces a 3DMF text file format of the 3D scene. This could be used to help solve data problems.

1. Select 3DMF Text from the Export submenu.
2. A standard Save dialog displays. Enter a name and select a location to save the text file and click Save.
3. A description of the 3DMF scene in your document is saved in text format:



## ◆ DXF File

Use the DXF File plug-in to save a 3D World document in DXF format. DXF (Data Exchange Format) is a standard 3D file format used by many CAD and 3D applications.

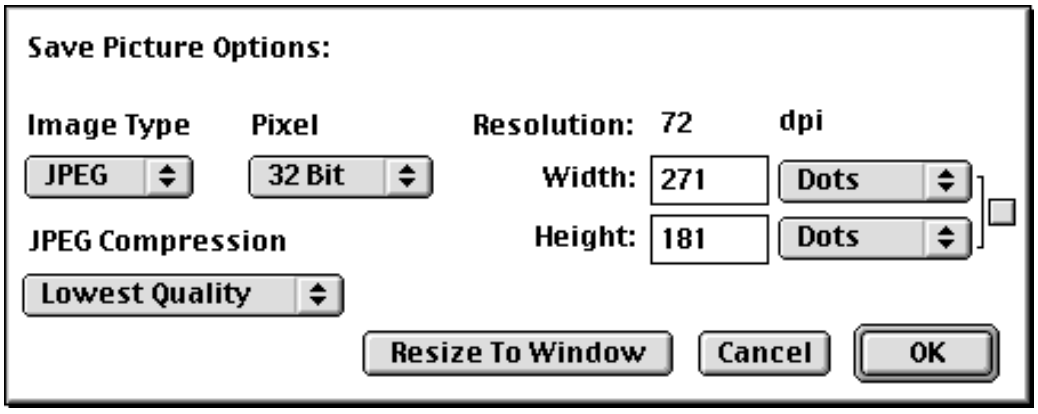
**Note:** The DXF File plug-in will only load if you are running QuickDraw 3D 1.5 or later.

1. Select DXF File from the Export submenu in the File menu.
2. A standard Save dialog displays. Enter a name and select a location to save the text file and click Save.
3. The 3D World document will be saved in DXF format.

## ◆ Picture

The Picture plug-in provides several format options for saving your document view.

1. Select Picture from the Export submenu. The Save Picture Options dialog displays:



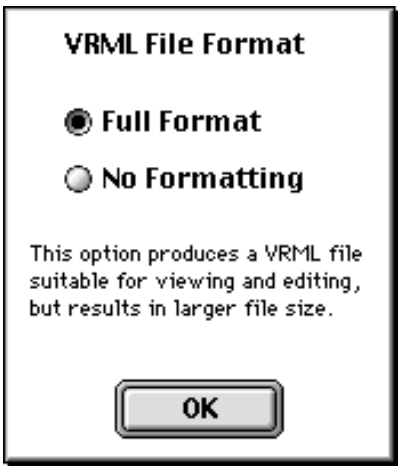

2. Select PICT, TIFF or JPEG from the Image Type popup menu.
3. Select a suitable quality from the Compression popup menu. The options available will depend on the Image Type selected.
4. Choose the desired pixel depth from the Pixel popup menu.

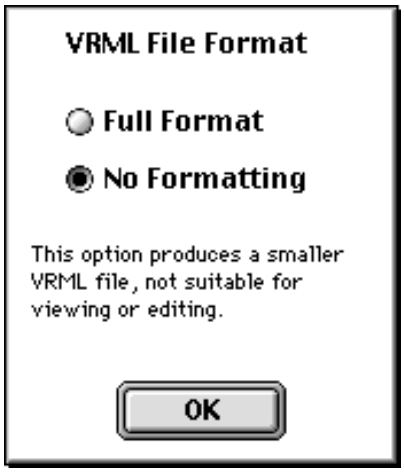
5. Enter a value in dots per inch to specify the resolution at which the picture is to be saved.
6. Select Dots, Millimeters or Inches from the units popup menus (constraining the proportions of the image by checking the checkbox if necessary), then enter values for the width and height required.
7. Click on the Resize to Window button to change the resolution back to 72 dpi and the width and height to the width and height of the contents of the document window.
8. Click OK to accept the options as set. Enter a name and select a location to save the file in the standard Save dialog that displays and click Save.

## ◆ VRML 1.0 Format

The Export VRML 1.0 Format plug-in is used to save 3D World documents as VRML 1.0 files (Virtual Reality Markup Language).

1. Select VRML 1.0 Format from the Export submenu.
2. A standard Save dialog displays. Enter a name and select a location to save the text file and click Save. The Format File dialog displays:


VRML File Format
Full Format
No Formatting
This option produces a VRML file suitable for viewing and editing, but results in larger file size.
OK


VRML File Format
Full Format
No Formatting
This option produces a smaller VRML file, not suitable for viewing or editing.
OK

3. Click on the Full Format radio button to produce a VRML 1.0 text file that can be viewed and edited, but will be a larger size than a file saved with No Formatting.

4. Click on the No Formatting radio button to produce a smaller VRML 1.0 text file not suitable for viewing or editing.
5. Click OK to save the VRML 1.0 file as specified.

# *Appendix C*

# *Menu Command Plug-ins*

Menu command plug-ins are accessed via the Plug-in menu.

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## Introduction

Select the plug-in icon in the menu bar. A list of available menu command plug-ins displays:

Select the plug-in name from the list to use it. Hold down the Option key and select the plug-in name to display any plug-in options that are available.

The first time a plug-in icon is selected, the top item in the menu is Last Plug-in, and this is grayed out. After selecting a plug-in, the top item will be the name of the last plug-in selected. This can be chosen by selecting the top item or typing Command - *.

3D Controller is a menu command and a palette. *See 3D Controller on page D-8 for more details*. The following plug-ins are available as both menu command plug-ins and plug-in modifiers: Add UV, Animate Color, Animate Textures, Bomb, Color, Delete Attributes, Gravity, Make Wireframe, Material, Random Color, Scale Object, Skin and Spin. *See Appendix H — Plug-in Modifiers on page H-1 for details*.

## ◆ Add Backface Style

The Add Backface Style command is used to ensure that all parts of a selected object are correctly defined as regards their front and back faces, in relation to the current view.

This command may be useful to edit objects created in other applications and imported into 3D World. For example parts of an object in an imported DXF file may have been defined incorrectly when initially drawn.

Select object(s) in the document window and choose Add Backface Style from the Plug-in menu. All components of the selected objects will be checked to ensure that they draw with their front faces towards the camera.

The Add Backface Style command applies a style to the selected objects. This is independent of the Backface option selected in the Renderer Options palette. *See Backface on page D-82 for more details*.

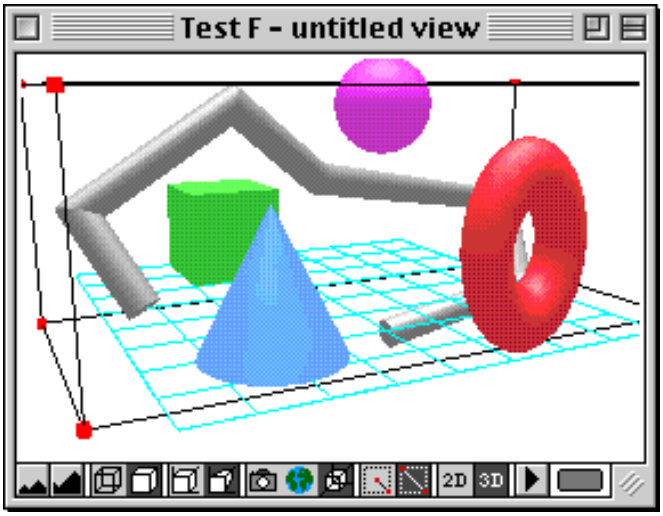
Remove the Add Backface Style by selecting the object and choosing Remove Styles from the Plug-in menu. *See Remove Styles on page 20 for more details*.

## ◆ Animate Camera

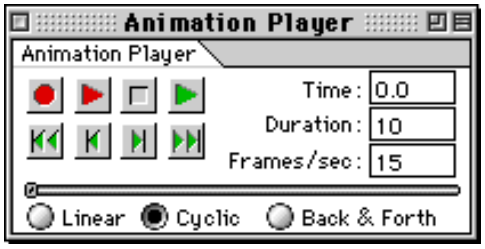
The Animate Camera plug-in is used to move the camera along a specified path, over a set time.

To use the Animate Camera plug-in you will require the Animation Tweener plug-in to be loaded. The Animation Player and Pipes plug-ins will also be useful.

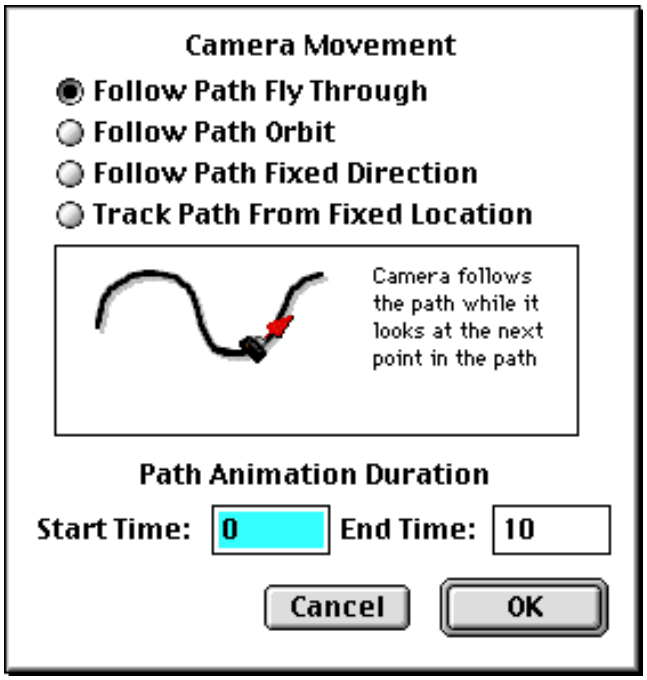
1. Define a path for the camera to be animated along. The screen shot below shows a path created by using the Pipes plug-in. *See Pipes on page G-43 for more details.*




2. Set up the Animation Player palette according to your requirements for the movie you wish to record. *See Animation Player on page D-12 for more details.*

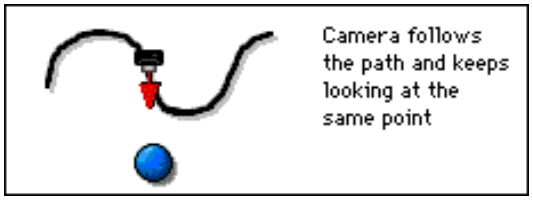


3. Select the path object in the 3D World document and choose Animate Camera from the Plug-in menu. The Animate Camera Options dialog displays:

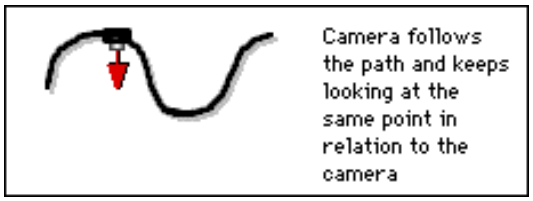



4. Select one of the Camera Movement radio buttons to specify the way in which the camera should move along the path. The preview below the radio buttons shows how the camera will move.

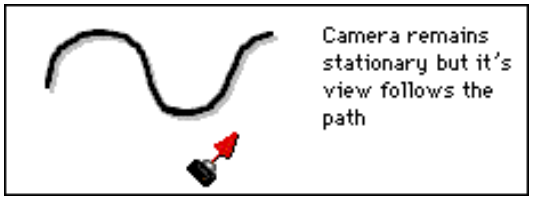
- **Follow Path Fly Through:** Both the camera object and the camera view will move along the path.
- **Follow Path Orbit:** The camera moves along the path, but the camera view remains centered at the point it was looking at initially. When using this option, set the camera view prior to selecting the Animate Camera plug-in.



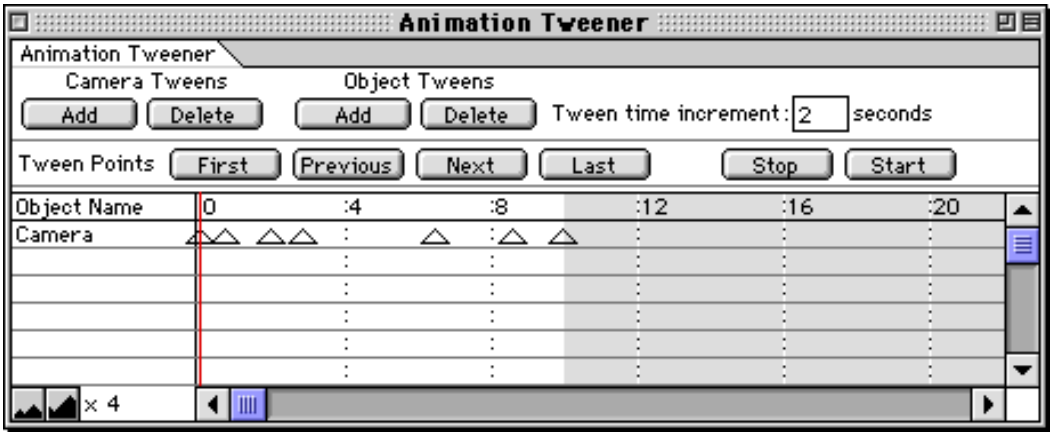
- **Follow Path Fixed Direction:** The camera moves along the path, the camera view settings remain constant in relation to the camera position.




- **Track Path From Fixed Location:** The camera remains in its initial position, the camera view follows the defined path.




5. Enter values in the Start Time and End Time fields to specify when this particular camera animation should start and finish. The maximum time for the camera animation is determined by the duration for the animation as set in the Animation Player palette. Multiple camera animations can be saved for different time periods in the same animation.
6. Once Animate Camera has been selected, Camera Tweens are saved and displayed in the Animation Tweener palette. The object drawn to define the path can then be deleted or moved to another layer and hidden. *See Animation Tweener on page D-17 for more details.*



**Note:** The camera is not linked to the path in any way. If the path is edited, the animation for the camera will not be changed. The camera must be animated along the new path for the animation to be updated.

## ◆ Anti-Alias

The Anti-Alias command is used to instruct the current renderer to anti-alias the image.

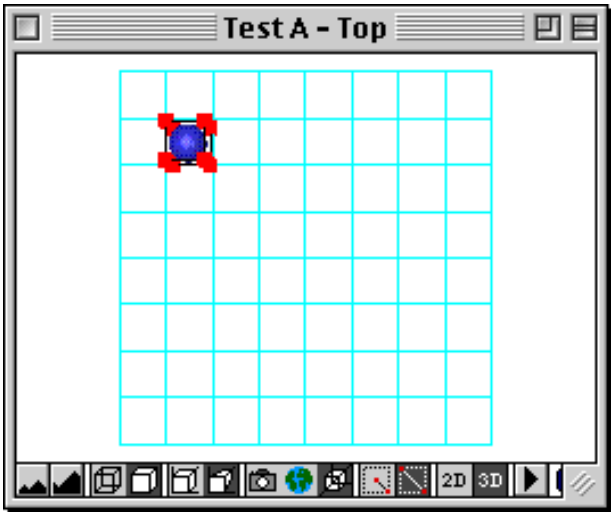
**Note:** The current renderer must support this plug-in for it to be used. The interactive renderer does not support this plug-in at this time. The Microspot Renderer supports image anti-aliasing but uses its own controls rather than this plug-in.

Select Anti-Alias from the Plug-in menu to turn on anti-aliasing. Select Anti-Alias again to turn the option off.

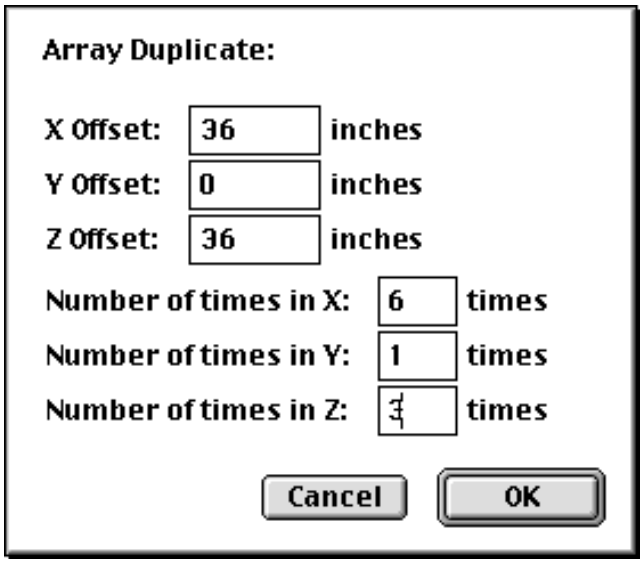
## ◆ Array Duplicate

The Array Duplicate plug-in is used to duplicate an object in any or all of the x, y and z axes, by a specified offset, a specified number of times.

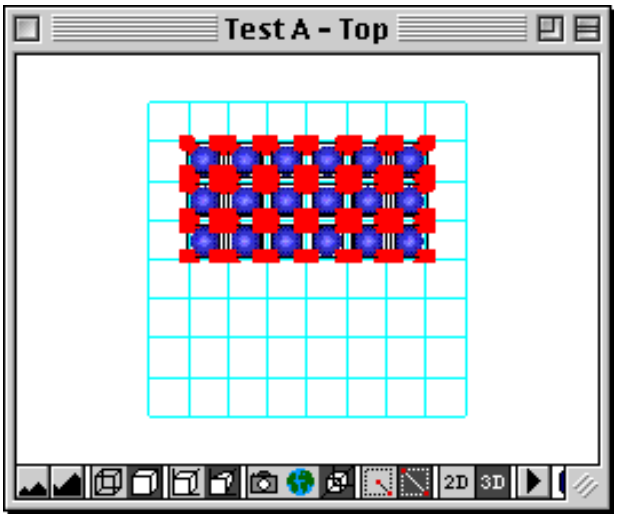
1. Select an object in the document.



2. Select Array Duplicate from the Plug-in menu. The Array Duplicate dialog displays:

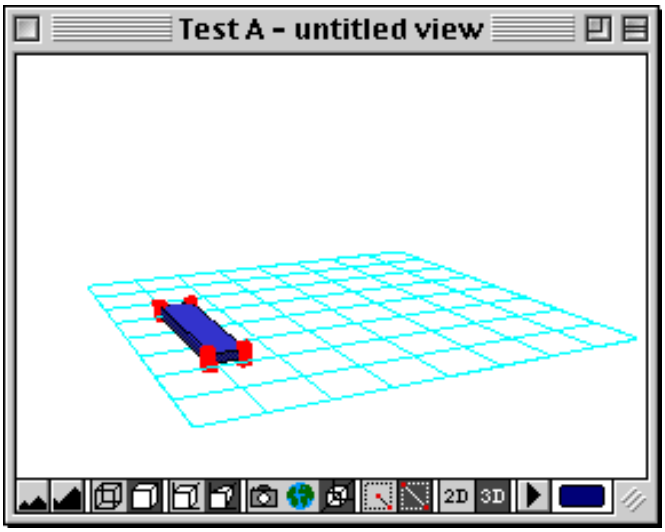

Array Duplicate:
X Offset: 36 inches
Y Offset: 0 inches
Z Offset: 36 inches
Number of times in X: 6 times
Number of times in Y: 1 times
Number of times in Z: 3 times
Cancel
OK

3. Enter an offset, and number of times for the object to be duplicated, in each of the x, y and z axes and click OK.
4. The object will be duplicated the specified number of times, with the duplication offset applied each time, in the x, y and z axes as per your settings.

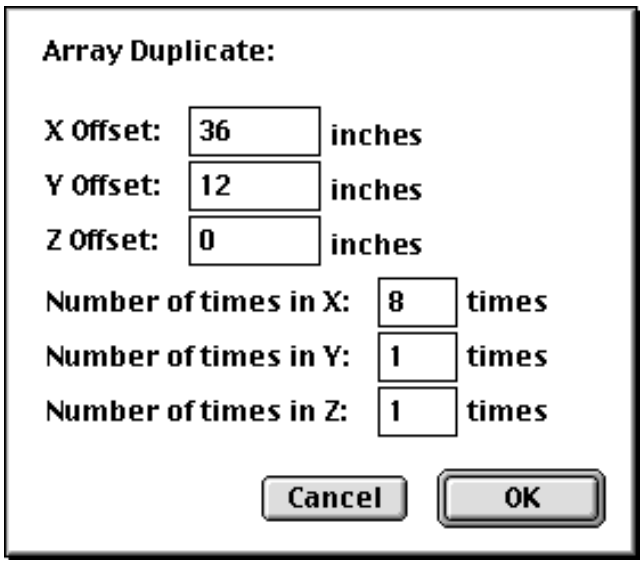



It is possible to apply an offset in more than one axis but only duplicate the selected object a set number of times in one axis. In this case, both the offset values are applied each time the object is duplicated.

1. Select an object in the document.

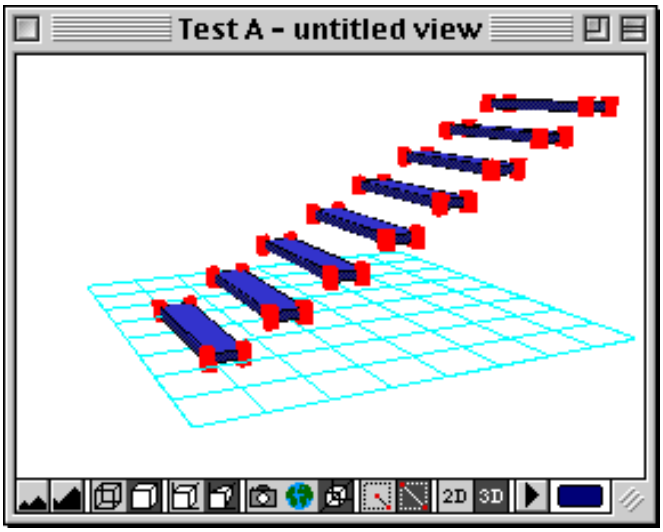



2. Select Array Duplicate from the Plug-in menu.
3. In the Array Duplicate dialog, enter an offset in both the x and y fields, but only duplicate the object in the x dimension:


Array Duplicate:
X Offset: 36 inches
Y Offset: 12 inches
Z Offset: 0 inches
Number of times in X: 8 times
Number of times in Y: 1 times
Number of times in Z: 1 times
Cancel
OK

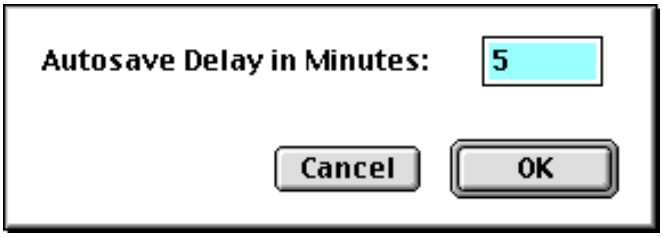
4. Click OK.

5. The object will be duplicated the specified number of times in the x dimension. Each time the object is duplicated, the specified offset in both the x and y axes is applied.



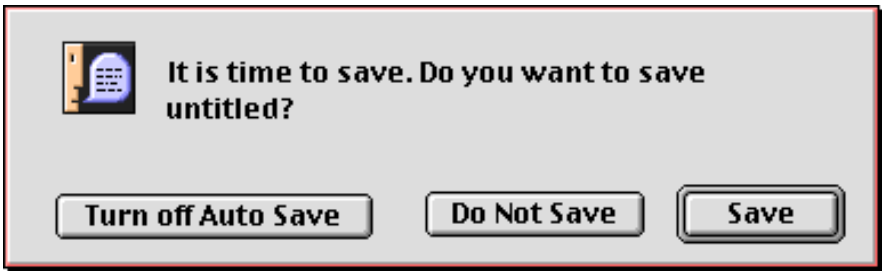

## ◆ Auto Save

Select Auto Save to turn on the Auto Save feature. A dialog displays for you to enter a value for the Auto Save period.




Enter a value in minutes and click OK. A check mark will display next to the plug-in name to show that Auto Save is on.

After the specified period, a dialog displays warning that it is time to save and giving you the opportunity to turn Auto Save off, to close the dialog without saving, or to save the document.

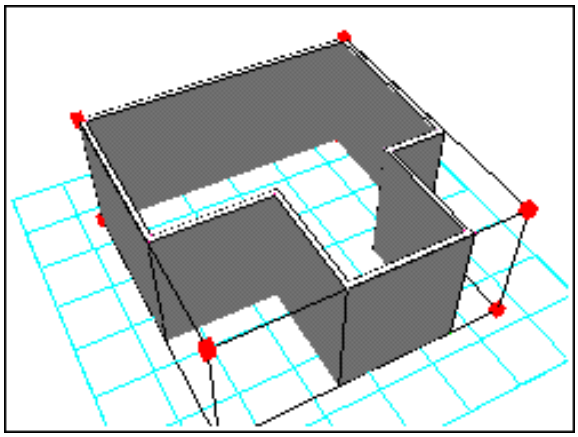



To turn Auto Save off, select the plug-in name again from the plug-in menu.

## ◆ Ceilings

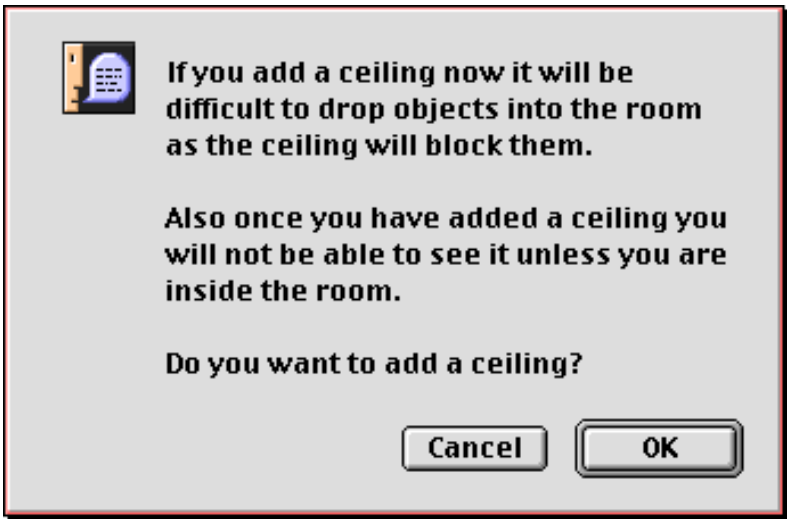
The Ceilings plug-in is used to quickly add ceilings to selected objects drawn with the 4 Walls or Walls drawing tools.

1. Draw an object using the 4 Walls or Walls drawing tool:



2. Select the object and choose Ceilings from the Command plug-in menu.

3. An alert displays warning you that it will be difficult to position objects in a room once the ceiling has been added, and that because of the way ceilings are designed, the ceiling will not be seen unless viewed from below.


If you add a ceiling now it will be difficult to drop objects into the room as the ceiling will block them.
Also once you have added a ceiling you will not be able to see it unless you are inside the room.
Do you want to add a ceiling?
Cancel
OK

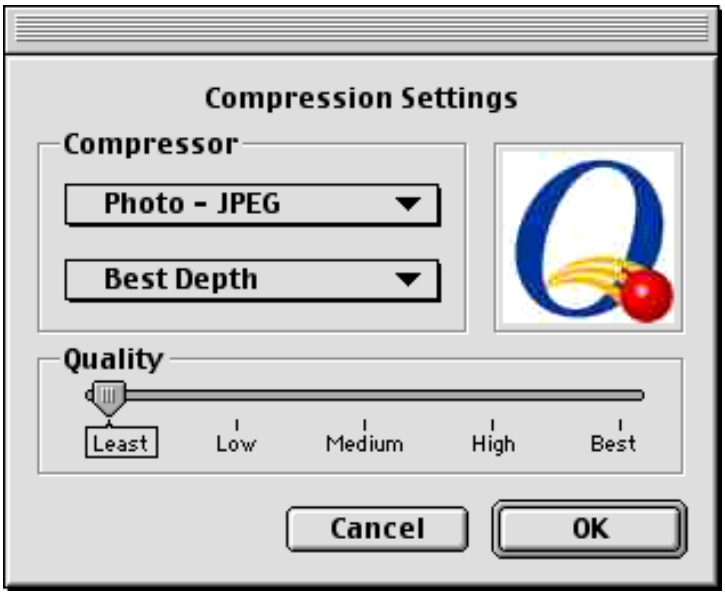
4. Click OK and a ceiling will automatically be added to the object.

## ◆ Compress Textures

The Compress Textures plug-in is used to reduce the amount of disk space used by textures applied to objects in 3D World documents. This feature is very useful for reducing the size of files that are to be used on the Web or transmitted by email.

1. Select an object in your 3D World document that has a texture applied to it and choose Compress Textures from the Plug-in menu.

2. The standard QuickTime Compressor dialog displays:




3. Choose the compressor to use and select the compressor options from the popup menu, then set the compression quality required (if this option is available for the selected compressor). Click OK to close the dialog.

   **Note:** The compressor types and options will vary according to the version of QuickTime installed. *See your QuickTime documentation for more information about compression*.

Depending on the type of compression chosen you may see some loss of image quality for the compressed texture, but the file will require less disk space. Experiment with the compression options to see which suits you best, if the textures are not intended to be viewed closely, any loss of quality may not be important.

## ◆ Construct Idler

The Construct Idler has two functions:

- **Performing CSG (Constructive Solid Geometry) Boolean calculations.** CSG operations allow one geometry to cut into another — enabling you to see into a room through a window for

example. The calculation is performed each time an object with a CSG attribute is changed, and may take a few seconds depending on the complexity of the document. The objects must have the appropriate CSG attributes applied to them, by using a plug-in that allows CSG attributes to be applied to objects, or by using library items that already have CSG attributes applied. Door and window library items supplied with the application, and walls drawn with the wall drawing tools, include the correct CSG attributes.

- **Automatically simplifying objects as rendering speed decreases.** When the Construct Idler is checked on in the Plug-in menu and rendering speed falls below 4 renders per second, the plug-in starts to simplify the objects in the scene that contain the most triangles, by turning them into cubes. This allows you to continue to edit a complex document in real time, even on one of the slower computers. Any selected items, windows and doors are not affected by this process. Items are re-drawn in full once the editing action is complete.

## ◆ Convert To Mesh

The Convert To Mesh plug-in converts any QuickDraw 3D 1.5 geometries, NURBs and general polygons into QuickDraw 3D 1.0 mesh geometries. This means that other applications that support only QuickDraw 3D 1.0 geometries will be able to understand 3D objects produced in 3D World.

1. Make a selection, or select nothing to convert the entire scene.
2. Choose Convert To Mesh from the Plug-in menu.
3. Any QuickDraw 3D 1.5 geometries, NURBs and general polygons, either in the selection or (if nothing was selected) in the entire scene, will be converted into QuickDraw 3D 1.0 mesh geometries.

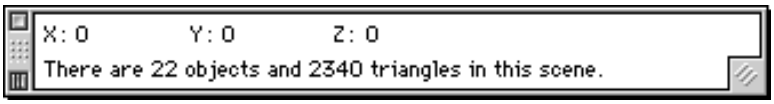
**Note:** Any QuickDraw 3D 1.0 triangles (which will be present if the Triangulate plug-in has been used) will be grouped together and converted into a single mesh geometry. The triangles may originally be from several different objects, and may not necessarily be connected in any way before conversion to a mesh geometry.

**Note:** There will be no visible difference between the QuickDraw 3D 1.5 geometries, NURBs and general polygons, and the QuickDraw 3D 1.0 mesh geometries, but the scene may render more slowly.

## ◆ Counter

The Counter plug-in counts the number of objects and triangles in the selection or scene.

1. Make a selection to count only the number of objects and triangles in the selected objects, or select nothing to count the number of objects and triangles in the entire scene.
2. Choose Counter from the Plug-in menu.
3. The number of objects and triangles is counted, and the result displayed in the Help palette. (Select Help from the Palette menu to display the Help palette.)




## ◆ Draw Direct

The Draw Direct plug-in is used to draw the 3D scene directly to screen.

When a large file is being drawn to screen it may take a few moments for the object to appear. It will then appear as a complete object as it will appear on screen once it has been completely drawn in memory.

To receive feedback as to what is happening during this time, select Draw Direct from the Plug-in menu. Objects will then be drawn directly to screen, and you will be able to see them in the process of being drawn rather than having to wait to see the finished object. To turn Draw Direct off, select the plug-in again from the Plug-in menu.

## ◆ Earthquake

Use the Earthquake plug-in to shake the view as though an earthquake were occurring.

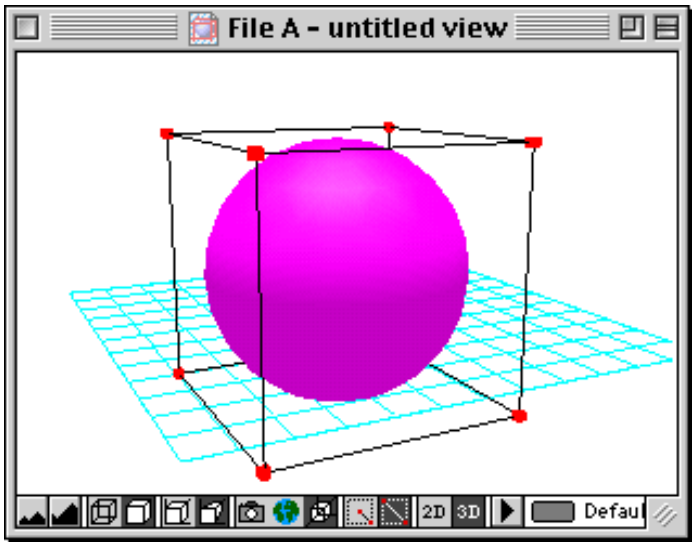
Choose Earthquake from the Plug-in menu. The view will be shaken and a sound will play for a short time. This does not change your document in any way.

## ◆ Enable Tinted Textures

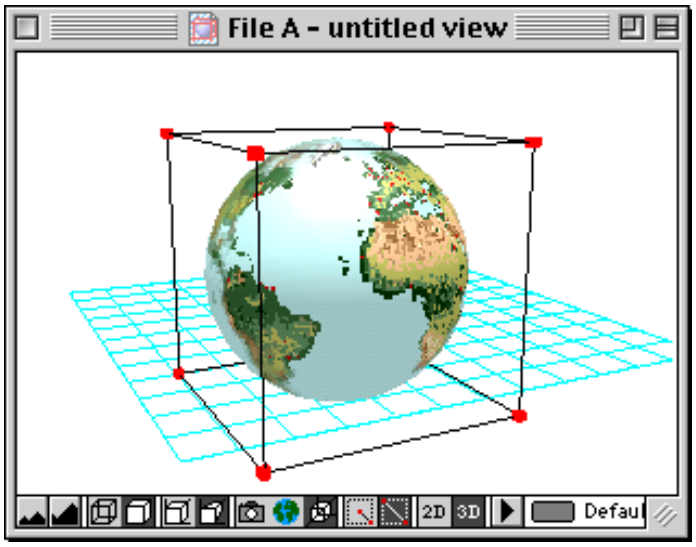
By default, when a texture is applied to an object it is placed over any color already applied to the object, and although the color attribute is still present, the color cannot be seen. The Enable Tinted Textures command is used to allow the texture of selected objects to be tinted with the objects surface color.

**Note:** This feature requires QuickDraw 3D version 1.6 to be running.

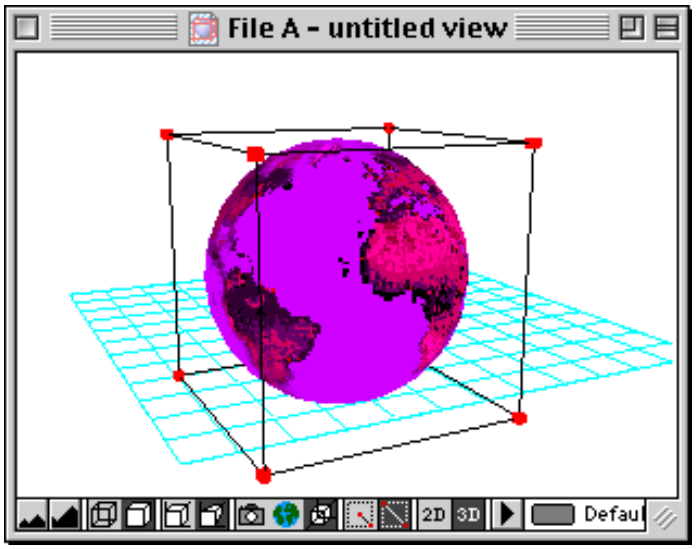
1. Select an object in the document window that has a color applied to it:



2. Apply a texture to the object by dragging and dropping a pict file on to it.




3. To specify that an object's texture will be tinted with its surface color, select the object in the document window and choose Enable Tinted Textures from the Plug-in Menu.
4. When the object has both a color and a texture applied to it, the object's texture will be tinted with the underlying color:



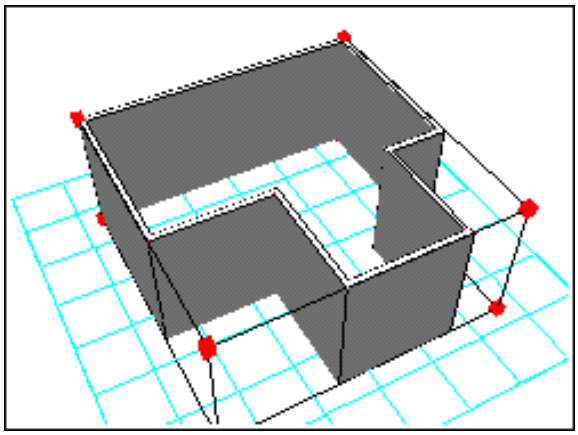

Select the object and select Enable Tinted Textures again to remove this ability from the object.

**Note:** A side effect of enabling tinted textures on an object is that any directional lighting effects are lost for that object. The object will display as if in ambient light only

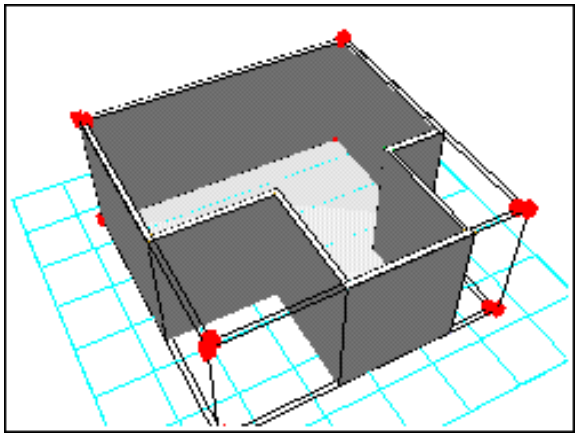
## ◆ Floors

The Floors plug-in is used to quickly add floors to selected objects drawn with the 4 Walls or Walls drawing tools.

1. Draw an object using the 4 Walls or Walls drawing tool:



2. Select the object and choose Floors from the Command plug-in menu.
3. A floor will automatically be added to the object.



**Note:** Floors are designed in such a way that they can only be seen if viewed from above.

## ◆ Interactive

The Interactive plug-in is a mode command that switches 3D World automatically between interactive and non-interactive rendering, to avoid the user having to manually switch the renderer to use.

1. Select Interactive from the Plug-in menu to switch into Interactive mode. A check mark by the plug-in name shows that it is active. The plug-in does not do anything when an interactive renderer is selected.
2. Select a non-interactive renderer (e.g. LightWorks SuperLite) in the Renderer Options palette.
3. The scene will be rendered using the non-interactive renderer.
4. Manipulating an object in the scene will cause 3D World to automatically switch back to using the interactive renderer.
5. If nothing is redrawn for 1 second, 3D World will automatically switch back to the non-interactive renderer and will redraw the scene with it.
6. Select Interactive again from the Plug-in menu to switch out of Interactive mode.

**Note:** The Interactive plug-in performs a similar function to the To Interactive plug-in, and ideally only one of these plug-ins would be used at the same time. If both plug-ins are loaded and active, the Interactive plug-in will take priority. *See To Interactive on page C-23 for more details.*

**Note:** The Interactive plug-in will only load if you are running QuickDraw 3D 1.5 or later.

## ◆ Rain

The Rain plug-in creates the effect of rain in the 3D document.

Select Rain from the Plug-in menu. An animated rain effect will appear in the document window. Select the plug-in again to remove the effect.

## ◆ Remove Styles

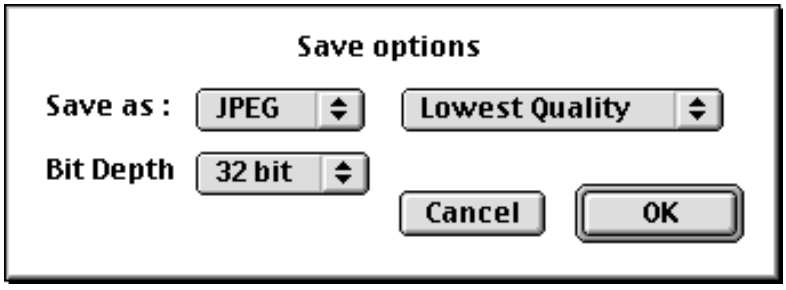
Use the Remove Styles plug-in to remove any styles that have been assigned to individual objects within the document.

Select the object(s) to remove styles from, then choose Remove Styles from the Plug-in Menu. Any styles (such as Add Backface Style) which have been added to the selected object(s) will be removed.

## ◆ Save Textures

Use the Save Textures plug-in to save the textures on any selected object as a file in PICT, JPEG or TIFF format. This is useful if you have modified a texture (e.g. with the Paint plug-in) or have a texture for which the original file has been lost.

1. Select an object with texture applied to it and choose Save Textures from the Plug-in menu.
2. The Save Options dialog displays:



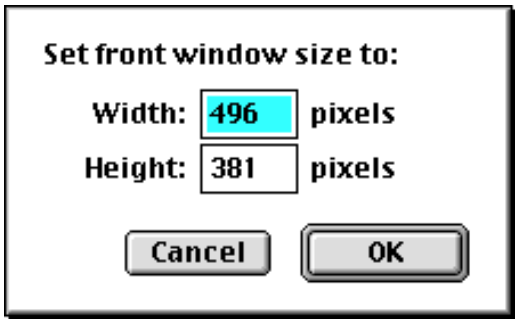

3. Select PICT, JPEG or TIFF as the file type from the Save as popup menu.
4. Select the desired compression option from the popup menu that is available when JPEG or TIFF is selected as the file type. PICT has no compression options.
5. Select the desired bit depth for the picture from the Bit Depth popup menu.
6. Click OK.

7. Enter a name for and location to save the file, in the standard save dialog that displays.
8. Click Save to save the texture in a file as per your directions.

## ◆ Size Window

The Size Window plug-in allows you to specify the size of the of the 3D World document window in pixels. This is useful, for example, when you want to output from the document as a QuickTime movie.

1. Select Size Window from the Plug-in menu. The Size Window dialog displays.




2. Enter values in pixels for the width and height of the document window and click OK.
3. The window size is changed to reflect your entries.

## ◆ Smooth

Use the Smooth plug-in to improve the appearance of certain objects by giving them a smoother surface.

Objects such as spheres, created in 3D World, have ‘vertex normals’ which allow an object, that is in effect made up of a series of triangles, to appear to have a smooth surface. Objects imported into 3D World, for example any imported DXF file, will not have vertex normals.

Select such an object then choose Smooth from the Plug-in menu. Vertex normals will be added to the selected object giving its surface a smoother appearance.

**Note:** This command will have no effect on an object that already has vertex normals.

To remove the smooth appearance from an object, select it and choose Delete Attributes from the edit menu. When the Delete Attributes dialog displays, select vertex normals from the list and click OK.

## ◆ Speed Cull

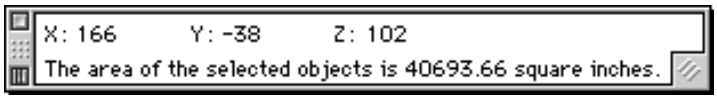
The Speed Cull plug-in is used to improve rendering speeds by assigning a bounding frame to a group. The renderer can then use the bounding frame to determine whether a group is visible or not, rather than having to look at each individual object.

Select Speed Cull from the Plug-in menu to switch into this mode. This is a global command, so all object groups will be assigned a bounding frame.

## ◆ Surface Area

The Surface Area plug-in calculates the surface area of the objects in a selection or in the entire scene.

1. Make a selection to calculate only the surface area of the selected objects, or select nothing to calculate the surface area of all the objects in the scene.
2. Choose Surface Area from the Plug-in menu.
3. The surface area is calculated and the result displayed in the Help palette. (Select Help from the Palette menu to display the Help palette.)



## ◆ Timer

Use the Timer plug-in to calculate how often the screen is redrawn per second. This will be useful in comparing the speed advantages of different hardware accelerator cards with software rendering, or to see the way that changing factors such as window size, wireframe rendering and backface removal can affect rendering speed.

1. Display the Help palette by selecting Help from the Palette submenu in the view menu.
2. Select Timer from the Plug-in menu.
3. The number of redraws per second is calculated over ten seconds, and the result displayed in the Help palette.

## ◆ To Interactive

The To Interactive plug-in is a mode command that switches 3D World automatically from non-interactive to interactive rendering, to avoid the user having to switch manually back to interactive rendering when the image is to be manipulated.

1. Select To Interactive from the Plug-in menu to switch into To Interactive mode. A check mark by the plug-in name shows that it is active. The plug-in does not do anything when an interactive renderer is selected.
2. Select a non-interactive renderer (e.g. LightWorks SuperLite) in the Renderer Options palette.
3. The scene will be rendered using the non-interactive renderer, but manipulating an object in the scene will cause 3D World to automatically switch back to using the interactive renderer.
4. To use a non-interactive renderer again, it must be manually selected.
5. Select To Interactive again from the Command plug-in menu to switch out of To Interactive mode.

**Note:** The To Interactive plug-in performs a similar function to the Interactive plug-in, and ideally only one of these plug-ins would be used at the same time. If both plug-ins are loaded and active, the Interactive plug-in will take priority. *See Interactive on page C-19 for more details.*

## ◆ Turbocharge

The Turbocharge plug-in is used to speed up redrawing of the 3D scene by converting selected geometries or the entire scene into QuickDraw 3D 1.5 trimesh geometries. QuickDraw 3D has been optimized to render this geometry type much faster than any other.

**Note:** The Turbocharge plug-in only loads if you are running QuickDraw 3D 1.5 or later.

1. Select and object or objects in the 3D World document. If nothing is selected, an alert displays warning that the command will be applied to the entire scene.
2. Select Turbocharge from the Plug-in menu. The selected objects or the entire scene will be converted.

# *Appendix D*

# *Plug-in Palettes*

Plug-in palettes are accessed via the Palettes menu. Select the palette name from the list to open it.

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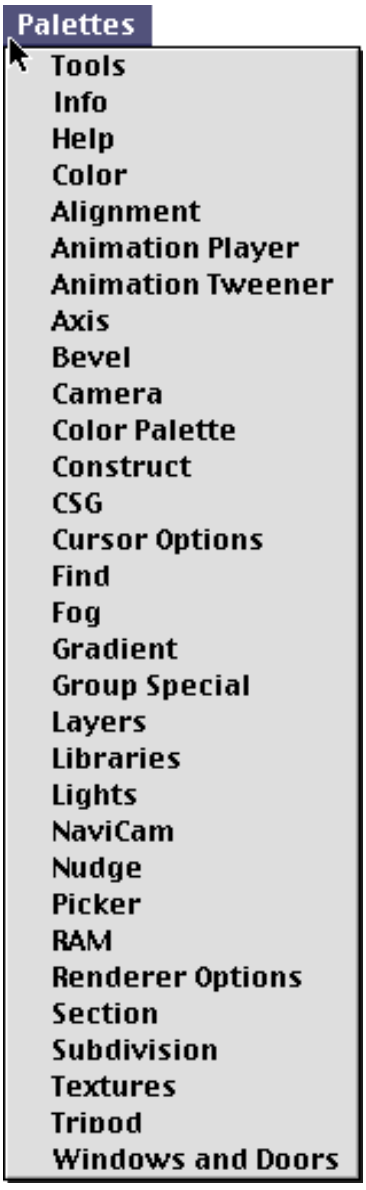
## INTRODUCTION

Click on Palettes in the application menu bar to display a list of available palettes. Select the palette name from the list to open it.



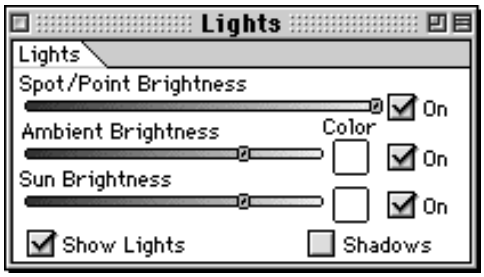

The Tools, Info and Help palettes are not plug-in palettes but are part of the core application. *See Chapter 4 — Palettes on page 4-1 for details.*

The Color palette is included only with the 3D Paint modifier plug-in. *See 3D Paint Color Palette on page I-19 for further details.*

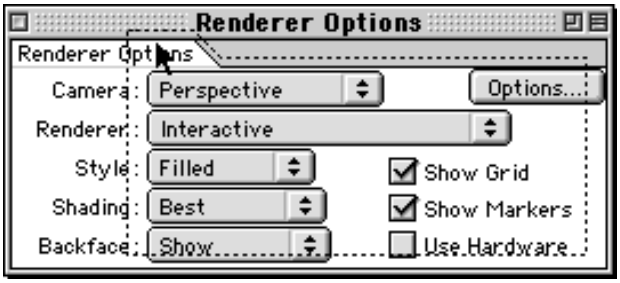
### Tabbed palettes

All plug-in palettes, except the Axis, Find, Layers and Section palettes, are tabbed palettes.

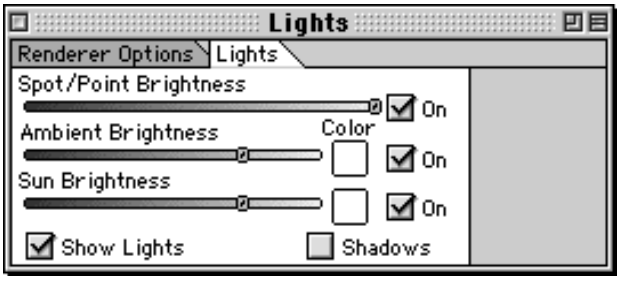
When a tabbed palette is opened, it displays in a window with the palette name on a tab at the top of the palette.



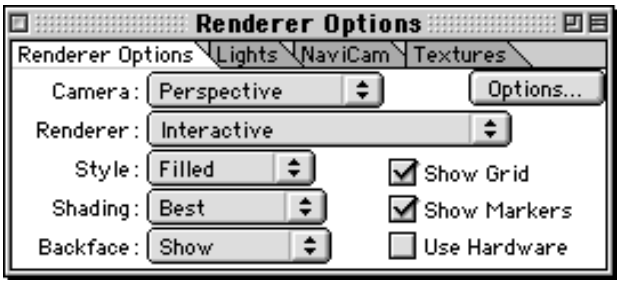

Tabbed palettes can be stacked together by simply clicking on the palette tab and dragging the palette onto the tab area of another tab palette:



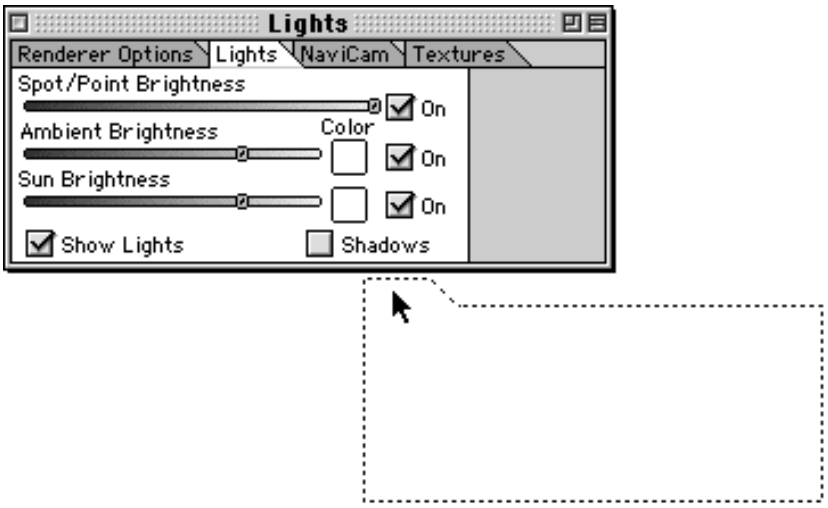

Both palettes then appear in the same palette. To access a palette click on its tab.



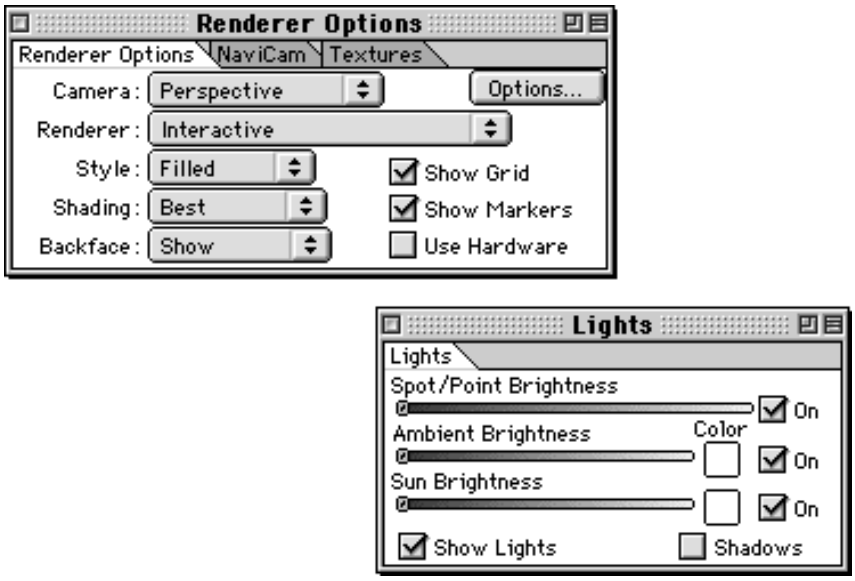
Any number of tabbed palettes can be stacked together, although in practice you may wish to limit this to the number of tabs that are visible in a palette.



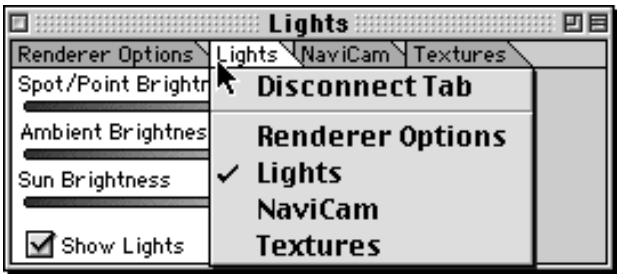

To remove a tabbed palette from a stack, click on the palette tab and drag the palette onto the desktop.



The palette will appear on its own, while the other palettes remain stacked together.




Click on a palette tab and hold down the mouse button to display the tab menu. This provides an alternate method of selecting other palettes or of disconnecting a palette from the stack.




Double click on a tab to reduce the palette, and any others stacked with it, to just the palette tab(s).

## ◆ 3D Controller

The 3D Controller plug-in is used to specify how a third party 3D controller device will control the 3D World environment. The 3D controller device must support the Apple Input Sprocket and also register itself as an Input Sprocket joystick.

### Assigning Actions to the 3D Controller Device

The 3D Controller palette provides six options for movement: translation in X, Y and Z, and rotation in the X, Y and Z axes. These options can be assigned to any six of the 3D controller device's controls.

The following three actions can also be assigned to any three of the 3D controller device's buttons:

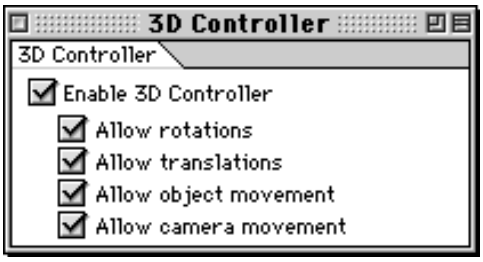
- Toggle between moving the camera and moving the selected object(s).
- Toggle the camera between perspective and orthogonal view.
- Go to Home View. If an object is selected, Home View will center on the selected object. If nothing is selected, the camera's Home View will display.

These movement options and actions are assigned to the 3D controller device via the Input Sprocket Configuration dialog. Select 3D Controller from the Plug-in menu to display the Configuration dialog. *Refer to the documentation provided with your 3D controller device for further details*.

### Using the 3D Controller Palette

Once the above options and actions have been assigned to the 3D controller device, the 3D Controller palette is used to enable or disable the device's capabilities.

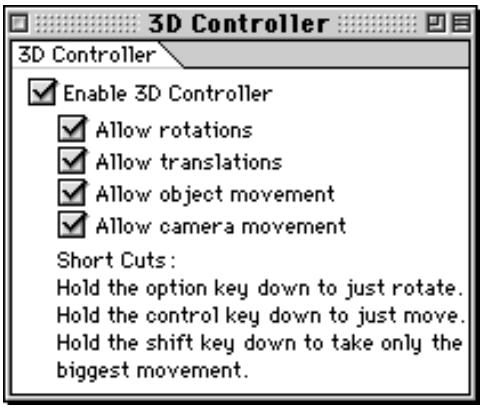
Select 3D Controller from the Palettes menu to open the 3D Controller palette:




- **Enable 3D Controller:** Check this checkbox to activate the 3D Controller device.
- **Allow rotations:** Check this option to allow the 3D controller device to be used to rotate selected objects or the camera.
- **Allow translations:** Check this option to allow the 3D controller device to be used to move selected objects or the camera.
- **Allow object movement:** Check this option to allow the 3D controller device to be used to move selected objects. If this option is not checked, the 3D controller device will not be able to be used to move objects, but the camera will move regardless of any objects selected.
- **Allow camera movement:** Check this option to allow the 3D controller device to be used to move the camera. If this option is not checked, the 3D controller device will not be able to be used to move the camera, only any selected objects.

**Note:** When both the Allow object movement and Allow camera movement options are checked: if any objects are selected the 3D controller device will move or rotate the selected items; if nothing is selected the 3D Controller device will move or rotate the camera.

Click on the palette's zoom button to extend the 3D Controller palette and display information regarding short cuts to use to temporarily enable or disable the 3D Controller options.


3D Controller
3D Controller
Enable 3D Controller
Allow rotations
Allow translations
Allow object movement
Allow camera movement
Short Cuts:
Hold the option key down to just rotate.
Hold the control key down to just move.
Hold the shift key down to take only the biggest movement.

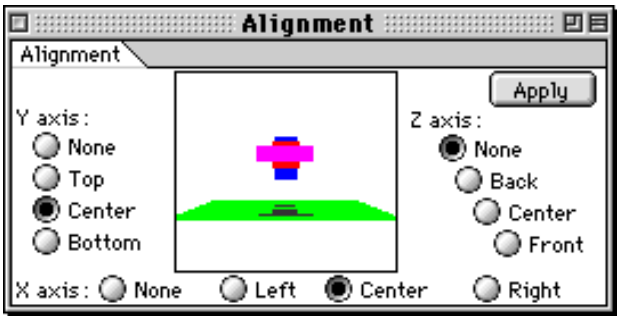
- **Hold down the Option key when moving objects or the camera:** To only rotate, not move, the selected objects or the camera. This is the same as checking the Allow rotations checkbox and unchecking the Allow translations checkbox.
- **Hold down the Control key when rotating objects or the camera:** To only move, not rotate, the selected objects or the camera. This is the same as checking the Allow translations checkbox and unchecking the Allow rotations checkbox.
- **Hold down the shift key down when performing a manipulation:** To only apply the action which will perform the greatest movement. A constrainer line will display to show the axis of this action.

If the Auto Look At option is checked in the Options menu, as an object is moved, the camera will track the moving object as if the Look At Selected command were constantly being applied. *See Auto Look At on page 3-39 and Look at Selected on page 3-32 for further details.*

## ◆ Alignment

The Alignment palette is used to align objects in any or all of the X, Y and Z axes.

1. Select Alignment from the Palettes menu to display the Alignment palette:




2. Select two or more objects in the document window then click on the radio buttons in the Alignment palette to specify how the objects should be aligned in the X, Y and Z axes.
3. The graphic in the dialog, of three objects and their shadows, provides feedback as to how the alignment will take place.
4. Click OK to apply the Alignment options.

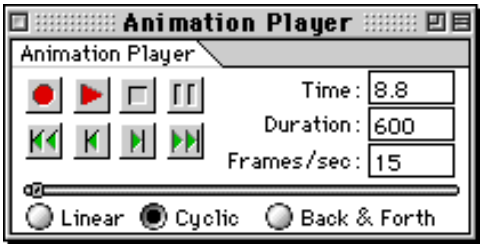
If one or more of the selected items are locked, they will not be moved, but other selected items will be aligned with the locked items. Locked items are treated as a single object for alignment purposes.

The line of alignment relates to the object that is in the most extreme position in the relevant direction. For example, when choosing align right in the X-axis, the line of alignment is defined as the right edge of the bounding frame of the object furthest to the right.

## ◆ Animation Player

The Animation Player palette is used to control the display of animation in the document and to record animations as QuickTime® movies.

Select Animation Player from the Palettes menu. The Animation Player palette displays:




### Animation Player Controls

**Record (Frame by Frame)**

Click on this button to record an animation, frame by frame, as a QuickTime movie. A standard dialog displays asking you to name, and specify the location to save, the QuickTime movie.

The animation will be recorded referring to the setting for Frames/sec, at the size of the document window.

**Note:** When recording a scene which includes an object to which a movie has been applied as a texture, the sound from that movie will not be played as recording takes place, and will not be recorded.

**Record (Real-time)**

Click on this button to record an animation in real time as a QuickTime movie. A standard dialog displays asking you to name, and specify the location to save, the QuickTime movie. The animation will be recorded at the speed it plays on screen, at the size of the document window.

**Note:** When recording a scene which includes an object to which a movie has been applied as a texture, the sound from that movie will not be played as recording takes place, and will not be recorded.

**Stop**

Click on the Stop button to stop the process of recording or playing, whichever is in progress. Clicking on the stop button when recording will end the recording and close the movie file.

**Play/Pause**

Click on the Play button to start animation playing. If animation is not being recorded, hold down the Option key and click on the Play button to play the animation frame by frame.

When the Play button has been selected and animation is playing, the button will change to the Pause button. Click on the Pause button to pause animation playing and/or recording.

**Move to Start**

Click on the Move to Start button to move to the beginning of the time line. 0.0 will be displayed in the Time field, and the slider on the time line bar will display at the left end of the bar.

**Scroll Back**

Click on the Scroll Back button and hold down the mouse button to scroll backward frame by frame. Release the mouse button to stop scrolling at any point. Hold down the Option key and click on this button to move back one frame only.

**Scroll Forward**

Click on the Scroll Forward button and hold down the mouse button to scroll forward frame by frame. Release the mouse button to stop scrolling at any point. Hold down the Option key and click on this button to move forward one frame only.

**Move to End**

Click on the Move to End button to move to the end of the time line. The value set in the Duration field will be displayed in the Time field, and the slider on the time line bar will display at the right end of the bar.

#### Time

The value displayed in the Time field is the position in time of the currently displayed frame. Enter a value and press the Return, Enter or Tab key to move to that position on the time line.

#### Duration

Enter a value in the Duration field and press the Return, Enter or Tab key to specify the length of the animation in seconds. The default value is 600.

#### Frames/Sec

Enter a value between 1 and 600 in the Frames/Sec field and press the Return, Enter or Tab key to specify the number of frames per second for the animation. The default value is 15.

#### Time Line Bar

The slider bar represents the time line for the animation. The left end is time 0.0 and the right end value is determined by the value entered in the Duration field. Click on the slider, hold down the mouse button and drag the slider right or left to move to a different position on the time line.

#### Linear

Click on the Linear radio button to specify that an animation should run once through to the end then stop.

#### Cyclic

Click on the Cyclic radio button to specify that an animation should play constantly, running through to the end then returning to the start to play again. This is the default setting.

#### Back & Forth

Click on the Back & Forth radio button to specify that an animation should play constantly, running through to the end, playing backward from the end to the start, and playing again.

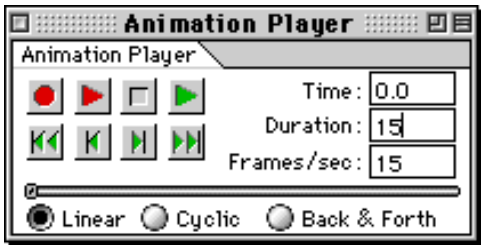
### Animation Player Tutorial

Work through this section to set up, play and record a simple animation and familiarize yourself with the Animation Player palette. This tutorial requires that the Animation Player, Animate Color, Cube and Spin plug-ins are loaded into 3D World. *See Loading Plug-ins when 3D World is Launched on page 1-7 and Loading Plug-ins while 3D World is Running on page 1-7 for further details.*

1. Open a new 3D World document.
2. Draw a cube in the center of the view:
   - Select the Cube Tool in the Tool palette.
   - Click in the document window and holding down the mouse button, drag to create a shape. Hold down the Shift key to constrain the shape to a cube. Release the mouse button when the cube is the desired size. *See Cube on page G-12 for more details.*
3. Open the Animation Player palette:
   - Select Animation Player from the Palettes menu.

- Position the palette beside the document window by clicking on its title bar and dragging it into position.

4. If this is first time the Animation Player palette has been used, it will be showing its default settings. To enter new settings:
   - If animation is playing, click on the Pause button.
   - Click on the Move to Start button to move to the start of the animation time line. Notice that the Time field now displays 0.0 and the slider on the time line bar is at the left.
   - Enter a value of 15 in the Duration field and press the Return, Enter or Tab key.
   - Enter a value of 15 in the Frames/Sec field and press the Return, Enter or Tab key.
   - Click on the Linear radio button.
   - The Animation Player palette should now look like the one below:




5. Change the color of the cube in the document window:
   - Click on the Default Color at the bottom right of the document window.
   - When the color picker displays, click on a red color to select it, then click on the OK button to close the color picker.
   - Click on the Default Color and, holding down the mouse button, drag the color onto the cube. Release the mouse button when the cursor is over the cube and it is highlighted.
6. Animate the color of the cube:
   - Select the Animate Color tool from the Tool palette.
   - Click on the cube. (Nothing will happen because animation is still turned off.)
7. Apply Spin to the cube:
   - Select the Spin tool in the Tool palette.
   - Click on the cube, hold down the mouse button and drag the cursor to specify the speed and direction of the spin. (Nothing will happen as animation is turned off.)

8. Play animation:
   - Click on the Play button in the Animation Player palette to play the animation. The cube will spin and continually change color.
   - Look at the Time field while the animation is playing. The value will increase until it reaches 15.0 (the value set for the duration of the animation). The animation will then stop, and the Time field will remain at 15.0. The animation stops because the type of animation chosen was Linear.
   - Click on the Move to Start button to return the animation to time zero, then click on the play animation button again to replay the animation.
9. Scroll through the animation:
   - Return to time zero, click on the Scroll Forward button and hold down the mouse button and to scroll through the animation one frame at a time. Stop the animation at any time by releasing the mouse button.
   - Click on the slider on the time line bar and, holding down the mouse button, drag it right or left. Notice that you are again scrolling through the animation.
   - If the document view does not update until you release the mouse button, it is not being updated dynamically. To see dynamic updates, you must turn on the Dynamic Updates preference in the Preferences dialog. *See Options on page 3-25 for further details.*

You have now set up and controlled a simple animation. The following instructions explain how to record that animation.

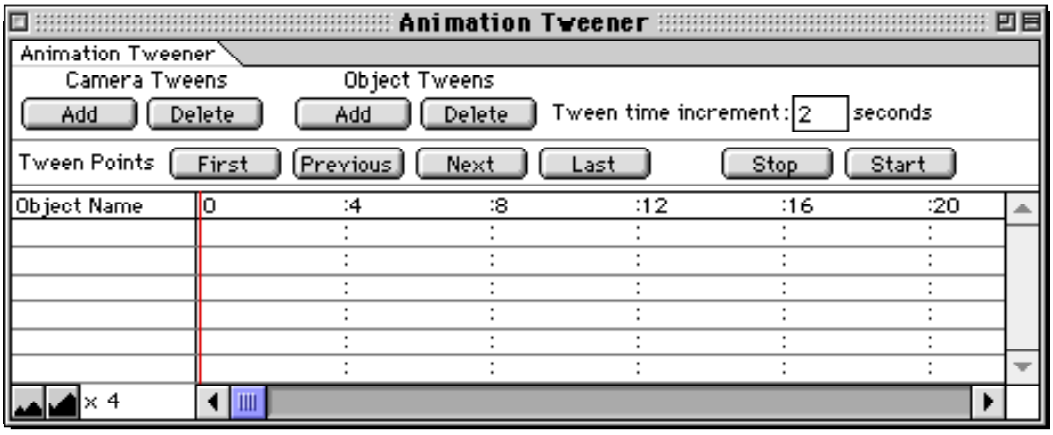
1. If animation is playing, click on the Pause button.
2. Return to time zero.
3. Click on the Record Frame by Frame button to record your animation frame by frame. In the standard dialog that displays, enter a name for, and specify a location to save, the QuickTime movie. Click Save.
4. The animation will automatically play and be recorded. It may take longer to run through this time, as it is being recorded frame by frame.
5. When the time reaches 15 seconds, recording will automatically stop and the movie file will be closed.

You have now recorded your animation. Locate the file on your hard drive and use a movie playing or viewing application to look at it.

## ◆ Animation Tweener

The Animation Tweener palette is used to specify the position, size and rotation of objects or the position, direction, zoom factor and view type of the camera at a specific time. The specified position is called a tween point, the positions between the set tween points are calculated by the computer. The resulting animation can be saved as a QuickTime movie using the Animation Player palette. *See Animation Player on page D-12 for more details.*

Select Animation Tweener from the Palettes menu to display the Animation Tweener palette:




### Animation Tweener Controls

#### Camera Tweens

Use the Add and Delete buttons to add or delete tween points for the camera. This specifies the position, direction, zoom factor and camera type at a particular time.

- **To add a camera tween point:** Adjust the view in the document window and click on the Add button in the Camera Tweens section. The tween point is displayed as a triangle marker at the current time, in the row marked Camera in the Animation Tweener palette.
- **To delete a camera tween point:** Move the current time to the position on the time line of the tween point to be deleted. Click on the Delete button in the Camera Tween section.

#### Object Tweens

Use the Add and Delete buttons to add or delete tween points for objects. This specifies the position, size and rotation of selected objects at a particular time. Tween points are generally

only added for selected objects but will be added for objects that are not selected if tween points have already been set for those objects at some time and the objects have been moved from their set or calculated positions.

- **To add an object tween point:** Select an object in the document window and click on the Add button in the Object Tweens section. The tween point is displayed as a triangle marker at the current time, in the row for the selected object in the Animation Tweener palette.
- **To delete an object tween point:** Move the current time to the position on the time line of the tween point to be deleted. Select the object in the Object Name list and click on the Delete button in the Object Tweens section.

#### Delete Alerts

When you click on the Delete button in either the Camera Tweens or the Object Tweens section, an alert will display asking if you are sure you want to delete the current tween point. Click Delete to delete the tween point or Cancel to return to the document without deleting the tween point. Hold down the Option key when clicking on a Delete button to prevent the alert from displaying.

Hold down the Command key when clicking on a Delete button to delete all the tween points for the Camera or selected object. An alert will display asking if you are sure you want to delete all the tween points. Click Delete to delete the tween point or Cancel to return to the document without deleting the tween points.

#### Tween time increment

Enter a value to specify the time in seconds between each tween point. Hold down the Option key when clicking on one of the Add buttons to add a tween point without causing the time to increase.

#### Tween Points

The First, Last, Next and Previous Tween Point buttons are used to move to the relevant tween points.

#### Start/Stop

Click on the Start button to start the animation playing from the current time line position.

Click on the Stop button to stop the animation playing at any point.

#### Time Line

In the lower part of the Animation Tweener palette a table displays a list of objects and the tween points added for those objects at specific points in time. Currently the palette does not recognize any names given to the objects via the Info Palette, so all objects will be listed as

Unnamed Object. The camera will however display as Camera in the list. Objects can be selected in the document window by selecting an Object name in the list and vice versa.

The time in seconds is displayed above the table, and the current position in time is marked with a vertical red line. Click in the top area of the table to position or drag the time line.

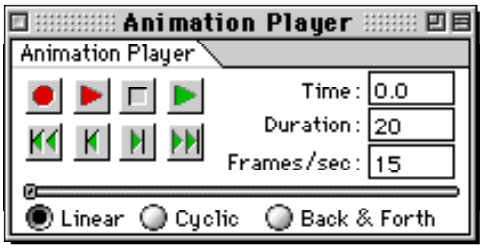
#### Zoom

Use the zoom controls at the bottom left of the palette to zoom in and out on the table, displaying a longer or shorter section of the time line.

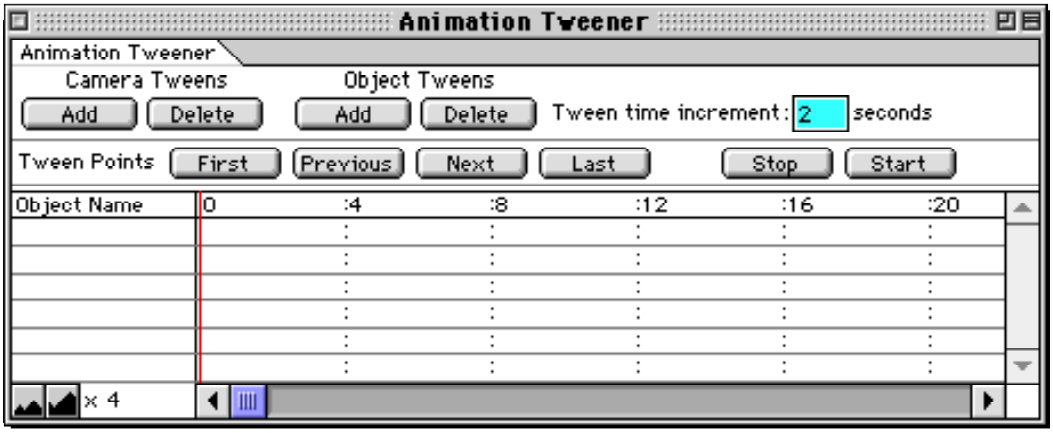
### Animation Tweener Tutorial

This tutorial requires the Animation Player, Animation Tweener and Cube plug-ins to be loaded into 3D World. *See Loading Plug-ins when 3D World is Launched on page 1-7 and Loading Plug-ins while 3D World is Running on page 1-7 for further details.*

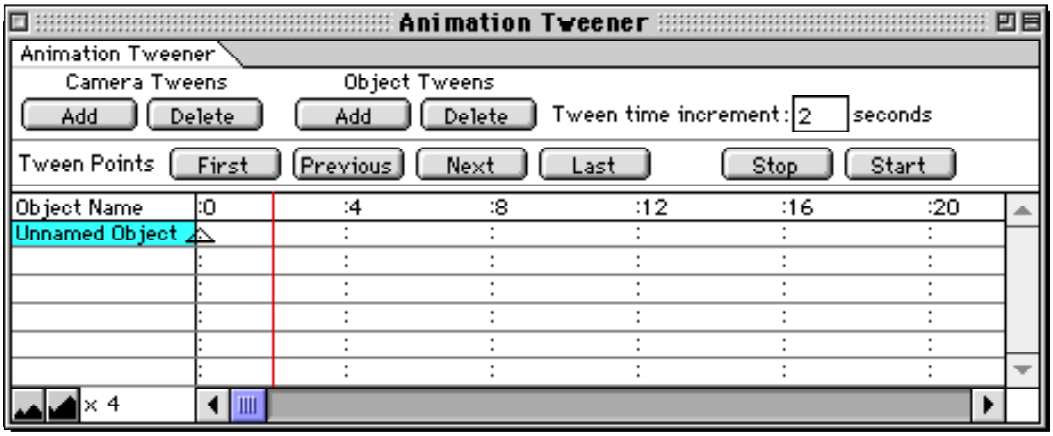
1. Open a new 3D World document.
2. Display the palettes:
   - Display the Animation Player palette by selecting its name in the Palettes menu.
   - Display the Animation Tweener palette by selecting its name in the Palettes menu.
   - Position each palette conveniently near to the document window by clicking on its title bar and dragging it into position.
3. Setting up the palettes:
   - Before setting any tween points, the time frame for the animation must be specified. Set the Animation Player palette as shown below. *See Animation Player on page D-12 for more details.*



- Check that the Tween time increment field in the Animation Tweener palette is set to 2 seconds.



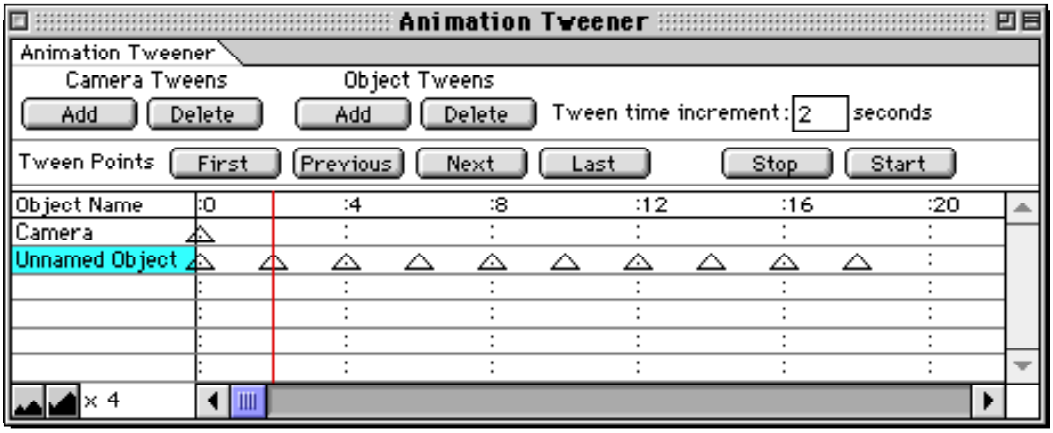

4. Draw a cube:
   - Select the Cube tool in the Tool palette.
   - Click in the document window, hold down the mouse button and drag to create a shape. Hold down the Shift key to constrain the shape to a cube. Release the mouse button when the cube is the desired size. *See Cube on page G-12 for more details.*
5. Set the first object tween point:
   - With the cube still selected, click on the Add button in the Object Tweens section of the Animation Tweener palette.



- When a tween point is added (unless the Option key is held down) the time value is automatically increased by the Tween time increment value. This is shown by the position of the red time line in the Animation Tweener palette and also by the value in the Time field of the Animation Player palette. The slider bar in the Animation Player palette will also move along the time line.

6. Move the cube:
   - Select the Rotate tool in the Tool palette.
   - Click on the cube in the document window to select it. Rotate it and move it to a different position.
7. Set next object tween point:
   - With the cube still selected, click on the Add button in the Object Tweens section of the Animation Tweener palette to add the next tween point.
   - The time will again be increased by the Tween time increment value.
8. Set further tween points:
   - Repeat steps 6 and 7 eight more times, rotating and moving the cube (or try selecting the Arrow tool in the Tool palette and resizing the cube), then adding another tween point. After adding the final tween point the Time will be 20 seconds (the value set for the duration of the animation).
9. Play the animation:
   - Click on the First Tween Point button in the Animation Tweener palette to return to time zero.
   - Click on the Start button in the Animation Tweener palette to play the animation. The path and positioning of the cube, between the tween points you set, is calculated by the computer, producing a smooth animation.
10. Return to time zero. The cube will display in the document window in its original position.
11. Change the view:
    - Select the cube.
    - Choose Look At Selected from the popup menu in the window toolbar. The view will change to show the cube in the center of the view.
12. Set a Camera tween point:

- Click on the Add button in the Camera Tweens section of the Animation Tweener palette. This sets the camera view at the current time.




- The Time value automatically increases by 2 seconds and the view changes to display the cube in the position set for this time.

**13.** Add further camera tween points:

- Repeat steps 11 and 12 nine more times, changing the view and/or zoom factor, and setting a Camera tween point. After adding the final tween point the Time will be 20 seconds (the value set for the duration of the animation).

**14.** Play the animation:

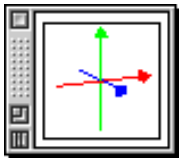
- Click on the First tween point button in the Animation Tweener palette to return to time zero.
- Click on the Start button in the Animation Player palette. The animation of the cube plays as previously. Now that Camera tween points have been added, the position of the camera also changes.

This tutorial produces a very simple animation, but the controls in the Animation Tweener and Animation Player palettes are used in just the same way to produce more complex animations. Tween points can be set for multiple objects within the document, but remember that only the position, size and rotation of an object can be specified at a particular time. Objects cannot be deleted at one time and still appear in the animation at a different time, and cannot ‘morph’ into shapes of different geometries.

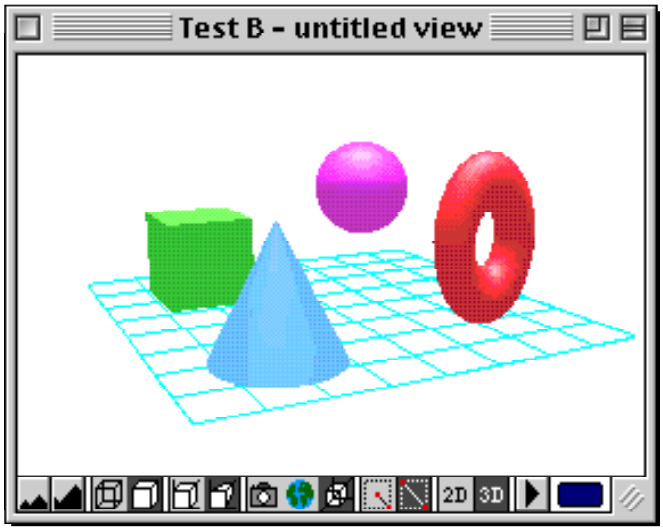
## Axis

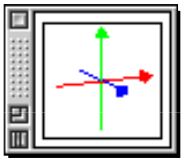
The Axis palette is used to display the current orientation of the front window's camera.

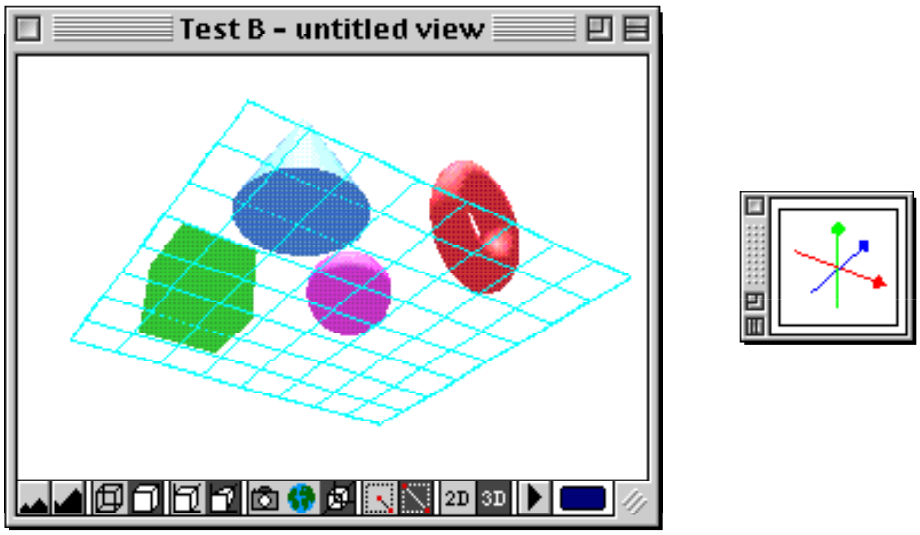
Select Axis from the Palettes menu to display the Axis palette:



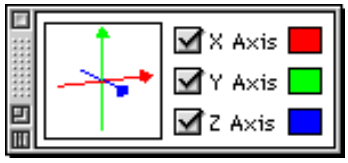
Select the Rotate tool in the Tool palette, click on the document grid and, holding down the mouse button, drag to rotate the grid. Notice that the positions of the axes in the Axis palette are updated to reflect the new orientation of the grid.



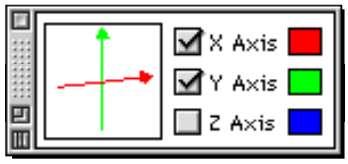






Click on the palette's zoom button to extend the Axis palette:




The axes are listed and the color of each axis shown. Next to the axis name is a checkbox that is used to display or hide the axis. Checking the check boxes on or off to specify which axes should be displayed in the palette.

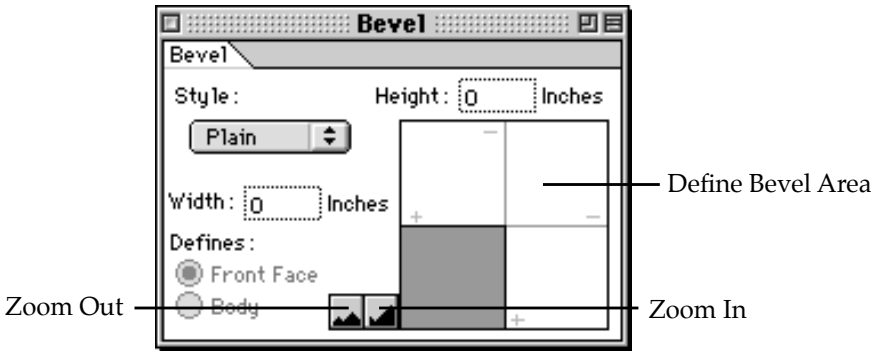


## ◆ Bevel

Use the Bevel Palette to apply a bevel to any shape that is made up of a path and cross section i.e. 3D Text, cone, cylinder, extruded bitmap, irregular polygon, pipes, pyramid, and regular polygon. The bevel is applied at both ends of the path or body of the shape.

**Note:** Bevels can only be applied to polygon and trigrid geometries, not conic or NURB geometries.

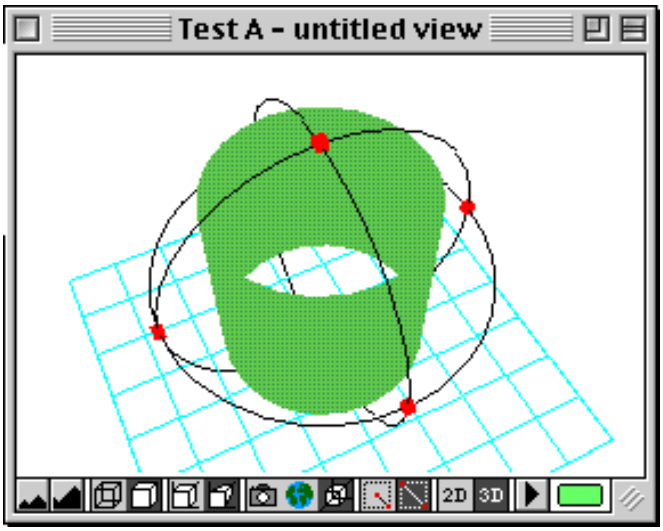
1. Select an appropriate geometry (e.g. a cylinder) in your 3D World document.
2. Select Bevel from the Palette menu to display the Bevel palette.



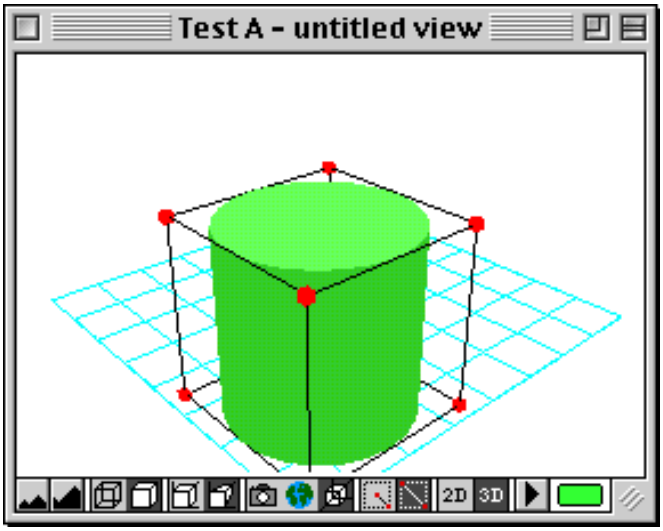

3. Adjust the settings in the Bevel palette (see below), and the selected shape will be updated to reflect the changes you have made.

**Style**

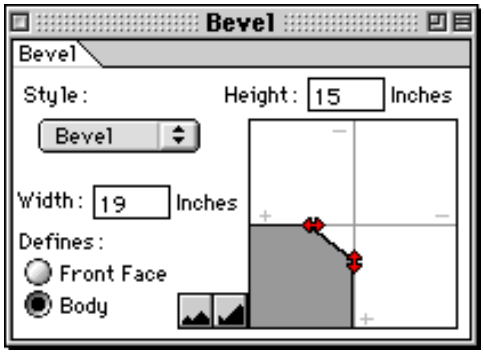
- **Hollow:** Removes the end caps from the geometry. There are no other options available for this style.

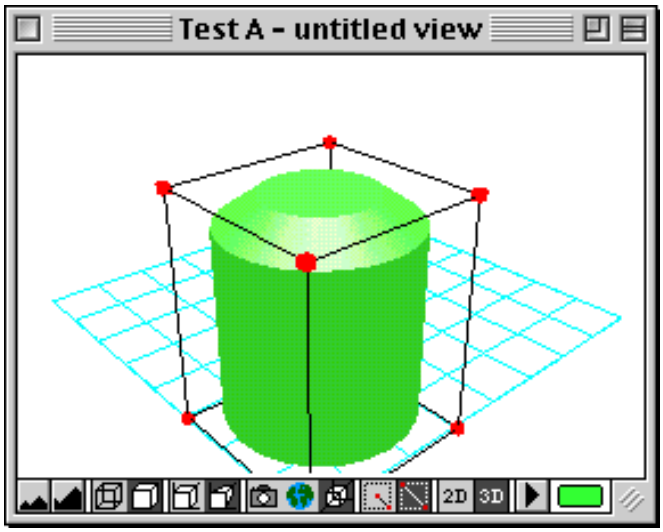



- **Plain:** Replaces the flat end caps on a geometry when they have been removed by using the Hollow style option, or turns off the bevel set by one of the other style options. There are no other options available for this style.

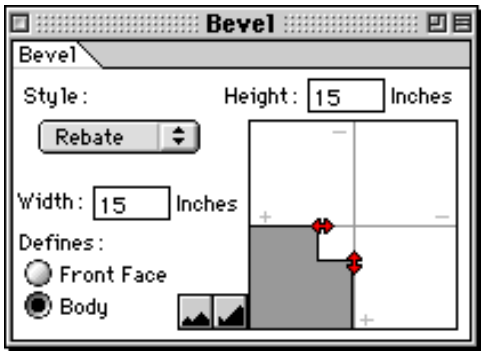


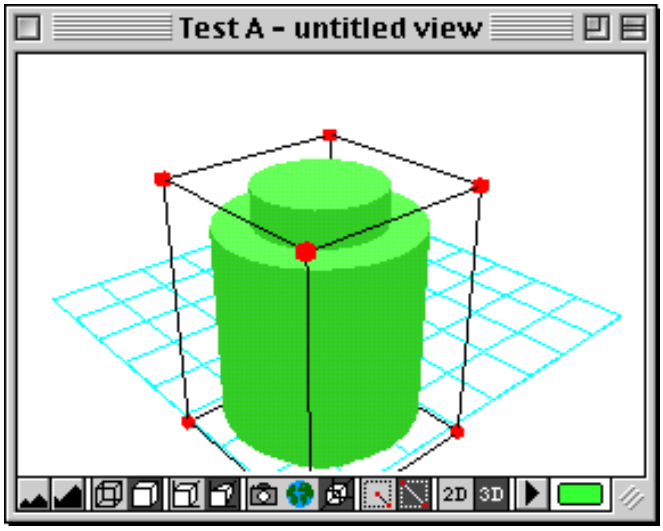
• **Bevel:** Applies a straight bevel to the geometry.



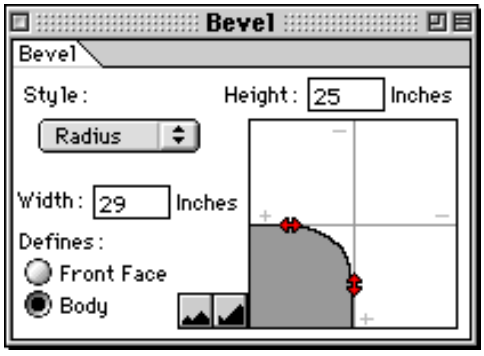



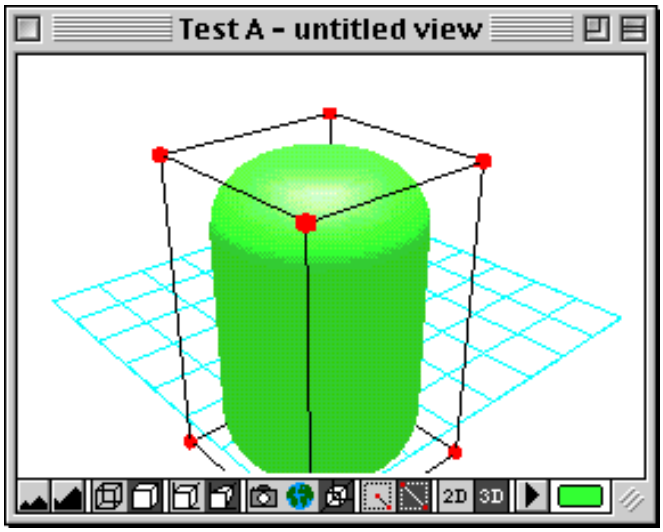

• **Rebate:** Cuts a square section from the edges of the geometry.



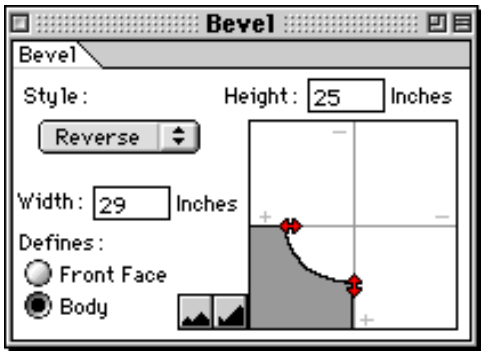



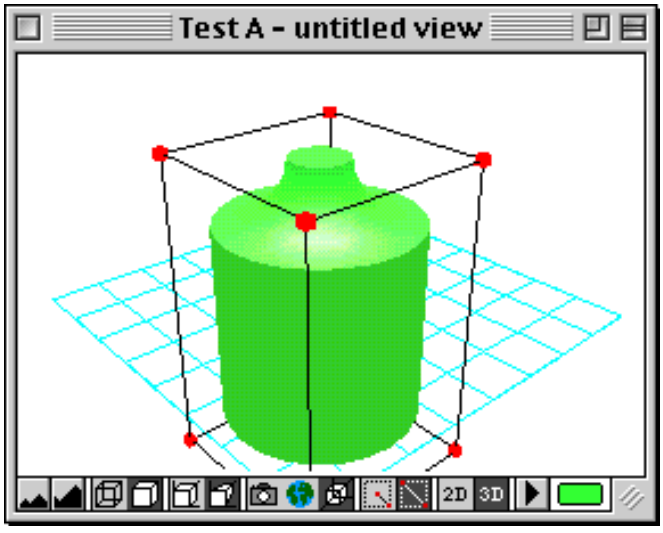
- **Radius:** Applies a convex curve to the edges of the geometry.




- **Reverse:** Applies a concave curve to the edges of the geometry.




#### Defining The Bevel

For the Bevel, Rebate, Radius and Reverse style options, define the bevel by sliding the red arrows in the Define Bevel Area, or entering values in the Height and Width fields.

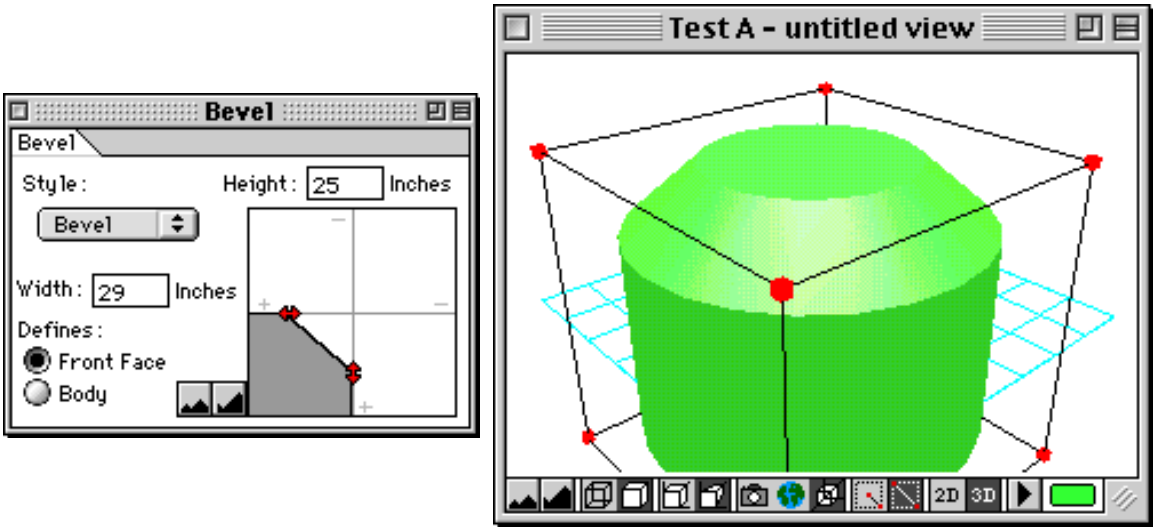
- If the horizontal arrow is in the positive area of the Define Bevel Area, the object will become narrower at its ends.

- If the horizontal arrow is in the negative area of the Define Bevel Area, the object will become wider at its ends.
- If the vertical arrow is in the positive area of the Define Bevel Area, the object will have raised ends.
- If the vertical arrow is in the negative area of the Define Bevel Area, the object will have indented ends.

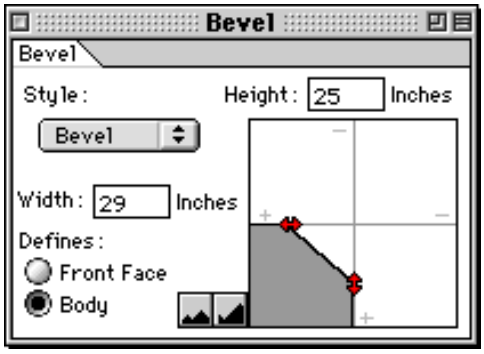
Use the Zoom buttons to zoom in or out of the Define Bevel Area.

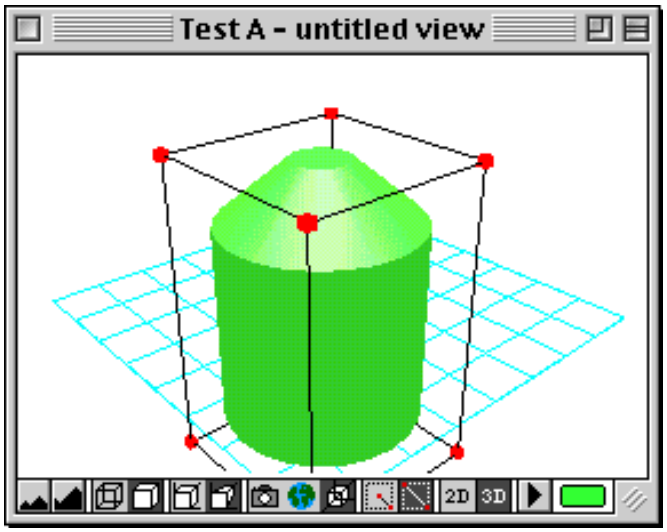
### The Bevel Defines

- **Front Face:** Select to specify that the front face or end cap of the geometry should remain a fixed size, and the bevel palette setting should affect the body of the geometry.



- **Body:** Select to specify that the body of the geometry should remain a fixed size, and the bevel palette setting should affect the front face or end cap of the geometry.



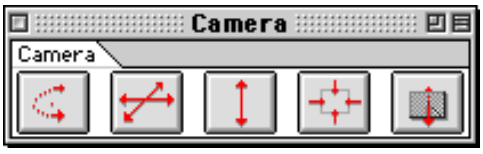




**Note:** The Front Face/Body setting can be very important when applying a bevel to 3D Text, when either the font outline or letter spacing needs to be maintained.

## ◆ Camera

The Camera Palette is used to manipulate the camera view of your 3D scene.

Select Camera from the Palettes menu to display the Camera palette:




**Tilt/Turn**

The Tilt/Turn control is used to change the camera's angle by tilting it up and down, or turning it left and right.

Click on the Tilt/Turn button, hold down the mouse button and drag the cursor to the left, right, up, or down. The view in the current window will change to reflect your movements.

To return to your original view, continue to hold down the mouse button and press the Escape key.

**Step/Crab**

The Step/Crab control is used to move the camera closer, further away, left, and right.

Click on the Step/Crab button, hold down the mouse button and drag the cursor up to step in closer or down to step further back. Click and drag to the left or right to move in that direction.

To return to your original view, continue to hold down the mouse button and press the Escape key.

**Height**

The Height control is used to change the height of the camera.

Click on the Height button, hold down the mouse button and drag up to raise the camera or down to lower the camera.

To return to your original view, continue to hold down the mouse button and press the Escape key.

**Zoom**

The Zoom control is used to narrow or widen the focus of the camera lens

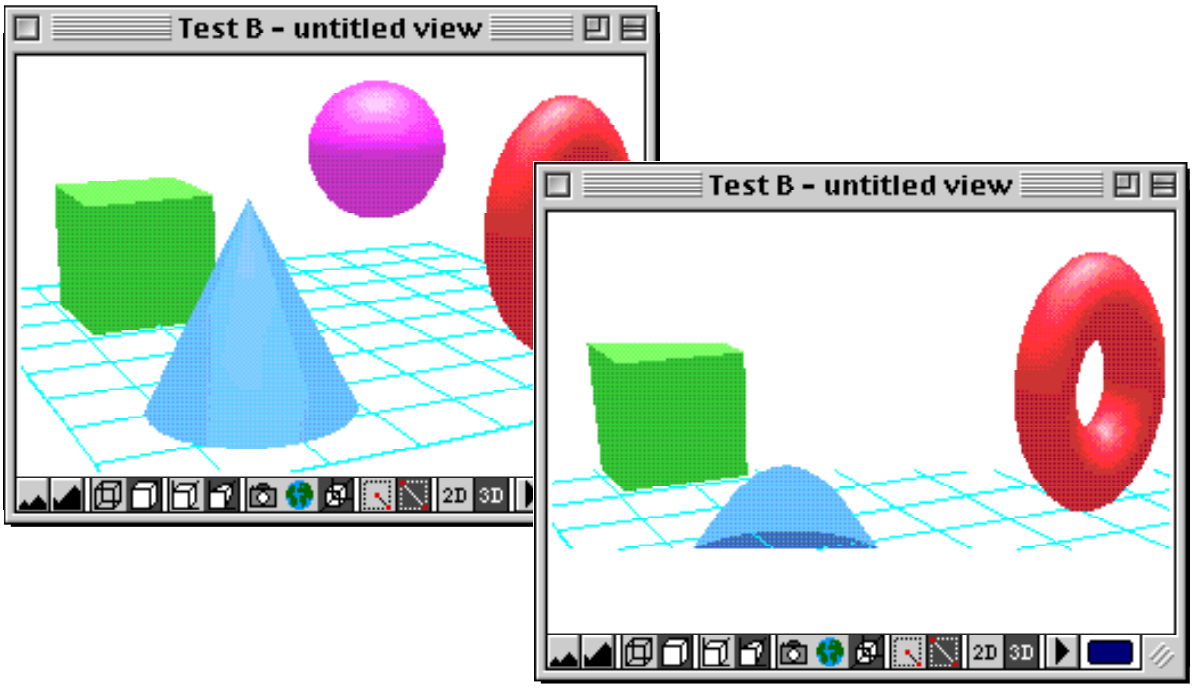
Click on the Zoom button, hold down the mouse button and drag up to zoom in or down to zoom out.

To return to your original view, continue to hold down the mouse button and press the Escape key.

**Clipping Plane**

The Clipping Plane control is used to adjust the camera's front and back clipping planes.

Although the clipping planes themselves are invisible, the effect they have on objects in the document can be seen. The front and back clipping planes can be set so that you view only a section of the document. Any objects or parts of objects closer to the camera than the first clipping plane, or further from the camera than the second clipping plane, will not be visible.




Click on the Clipping Plane button, hold down the mouse button and drag up to move the front clipping plane further away from the camera or down to move the front clipping plane towards the camera. Hold down the Option key and drag up and down to move the back clipping plane.

As the clipping planes are set in relation to the camera, as the angle or position of the camera changes, the clipping planes will also move.

To return to your original view, continue to hold down the mouse button and press the Escape key.

## ◆ Color Palette

The Color Palette plug-in provides a repository for 12 colors.

1. Select Color Palette from the Palette menu to display the Color Palette:

2. To use a color in the Color Palette, drag and drop it onto an object, the background, grid or color box in the Info Palette, or select an object in the document window and click on a color in the Color Palette.
3. To change a color in the Color Palette, drag and drop a new color over an existing one, or, when nothing is selected in the document, click on a color to open the color picker and choose a new color.

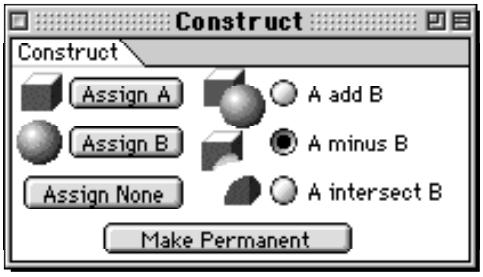
## ◆ Construct

The Construct palette is used to perform CSG (Constructive Solid Geometry) Boolean operations by cutting into one geometry with another.

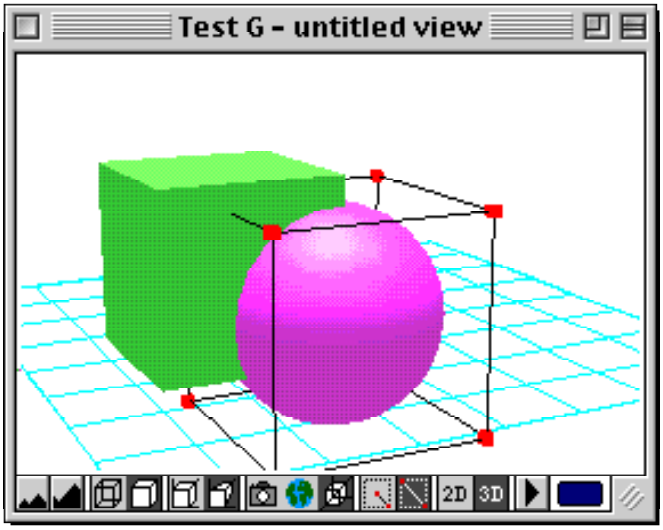
**Note:** The Construct palette can be used to perform *interactive* Boolean operations if you have a QuickDraw 3D hardware renderer from Apple Computer Inc. If you don't have this card, Boolean geometries can still be created, but not interactively. If you have the Construct Idler plug-in loaded, Boolean operations are calculated each time the scene is changed; this may take a few seconds depending on the complexity of the document. *See Construct Idler on page C-13 for more details.*

**Note:** The Construct palette supersedes the CSG palette.

Select Construct from the Palettes menu to display the Construct palette:



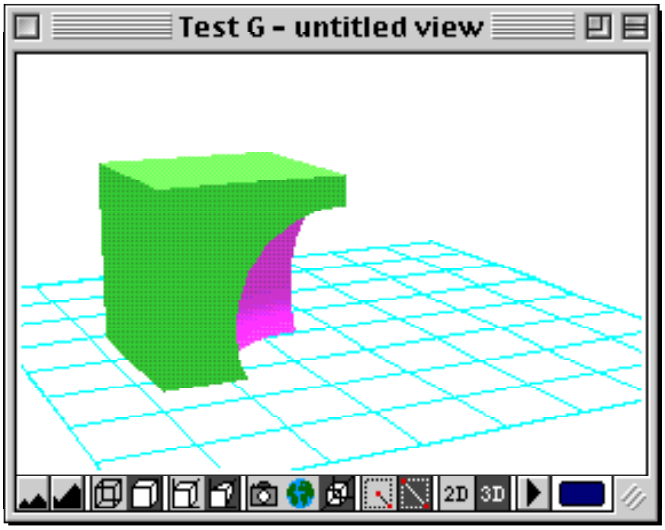

1. In the document window, position two objects so that they intersect:



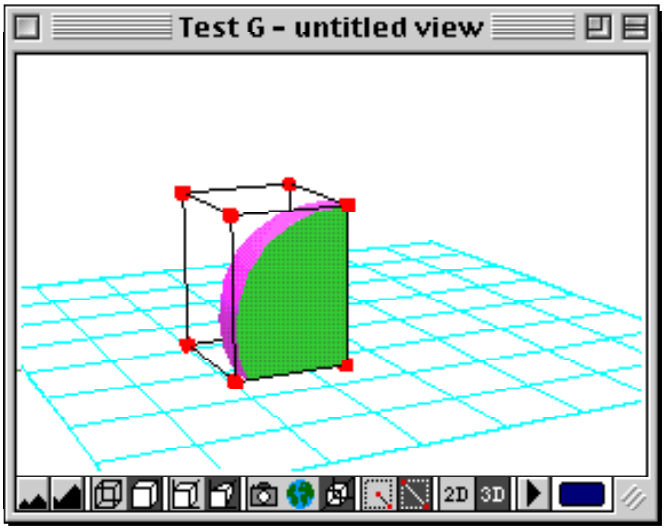

2. Select one of the objects (in this example, the cube) and click on the Assign A button to specify that this should be a type A object.
3. Select the other object (in this example, the sphere) and click on the Assign B button to specify that this should be a type B object.
4. If necessary, clear the assigned CSG attribute from an object by selecting an object and click on the Assign None button.
5. Click on one of the radio buttons on the right of the palette. The effect of these buttons will be seen immediately if you have the Apple hardware renderer, and after a short delay if you have the Construct Idler plug-in loaded:

   • **A add B:** Creates a geometry that has only the outer surfaces of A and B. Choosing this option will have no visible effect.

- **A and not B:** Display only the portion of object A not intersected by object B:




- **A intersect B:** Display only the portion of object A that is intersected by object B:




6. If you have a QuickDraw 3D hardware renderer from Apple Computer Inc., one of the objects may be invisible, but it can still be selected and moved. The geometry displayed will be updated interactively to reflect the new position of an object as it is moved.
7. If you have the Construct Idler plug-in loaded, one of the objects may be invisible, but it can still be selected and moved. The geometry displayed will be updated to reflect the new position of the object.

8. Click on the Make Permanent button to create a permanent geometry that can be viewed by someone without the Apple hardware renderer or the Construct Idler plug-in.
9. If you do not have the Apple hardware renderer or the Construct Idler plug-in, click on the Make Permanent button to calculate the Boolean operation. This may take a few seconds to calculate but the results will be as above. The Make Permanent action can be undone if the desired effect is not achieved, and the objects repositioned.

The radio button controls described above are global controls and will affect all CSG objects in the document. As many objects as you wish may be specified as type A and type B type CSG objects and will all interact with each other according to type.

#### The Construct Plug-in Tool

The Construct plug-in is also available as a plug-in modifier tool.

To use the Construct tool in the Tool palette:

1. Select the Construct tool from the Tool palette:

2. In the document window, select the object to perform the Boolean operation on (object A).
3. Depending on the Boolean option radio button currently selected in the Construct palette, the cursor will display as one of the following:
   - A plus sign for A add B.
   - A minus sign for A minus B.
   - An ampersand (&) for A intersect B.
4. Click on the object you want to perform the operation with (object B). The Boolean operation will be applied permanently to the two objects.

To change the options set in the Construct palette, hold down the Option key and click on the Construct tool in the Tool palette. The Construct palette will open.

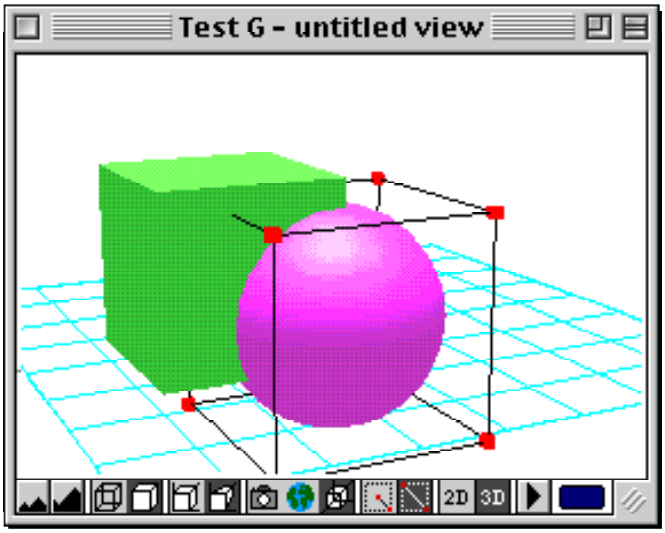
## ◆ CSG

The CSG palette is used to perform interactive Boolean operations by cutting one geometry with another (CSG stands for Constructive Solid Geometries).

**Note:** You will require a QuickDraw 3D hardware renderer from Apple Computer Inc. to use the CSG palette. The Construct palette, which supersedes the CSG palette, and the Construct Idler plug-in can be used to perform non-interactive Boolean operations without a hardware renderer. *See Construct on page D-33 for more details.*

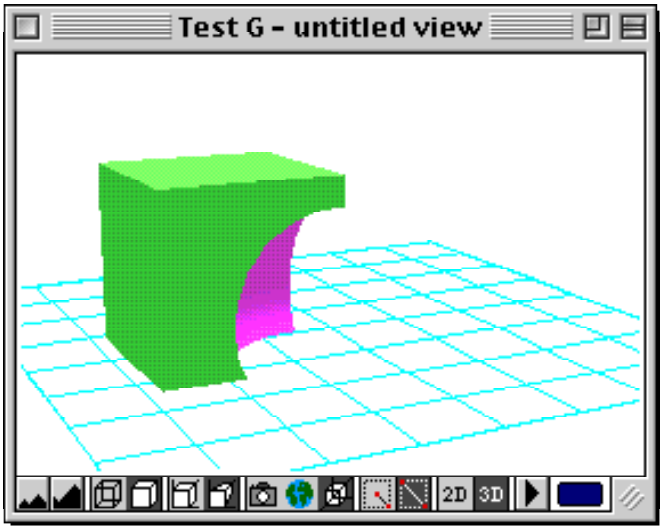
Select CSG from the Palettes menu to display the CSG palette:

1. In the document window, position two objects so that they intersect:

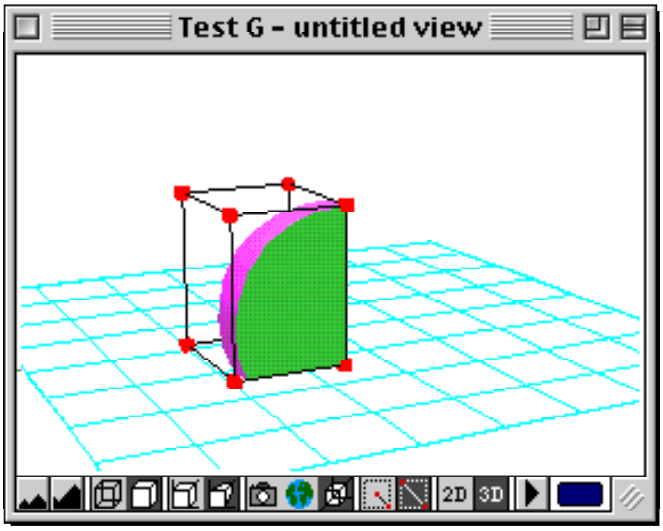



2. Select one of the objects (in this example, the cube) and click on the Assign A button to specify that this should be a type A object.

3. Select the other object (in this example, the sphere) and click on the Assign B button to specify that this should be a type B object.
4. Select the A and not B radio button to display only the portion of object A not intersected by object B:




5. Select the A intersect B radio button to display only the portion of object A that is intersected by object B:

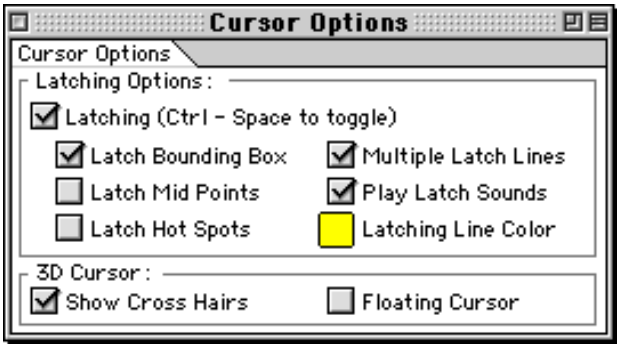


6. Although an object may be invisible, it can still be selected and moved. The geometry displayed will be updated interactively to reflect the new position of an object as it is moved.

The radio button controls described above are global controls and will affect all CSG objects in the document. As many objects as you wish may be specified as type A and type B type CSG objects and will all interact with each other according to type.

## ◆ Cursor Options

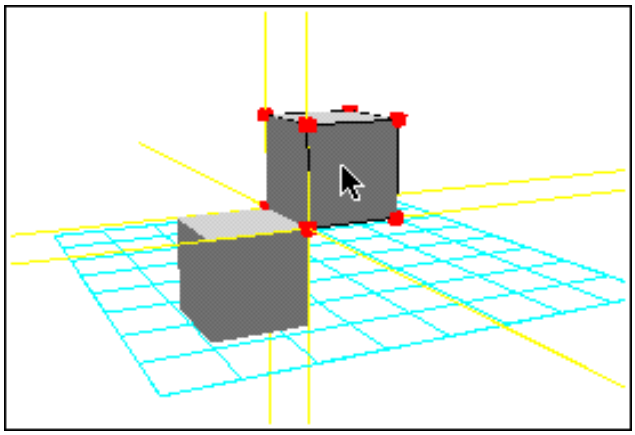
The Cursor Options palette allows you to control the alignment and positioning of objects with other objects, and the display and positioning of the cursor. Select Cursor Options from the Palettes menu to display the palette. Click on the shrink/expand button at the top right of the palette to show or hide the lower section.




### Latching Options

Latching is the alignment or snapping of points with other points. When positioning objects, latching lines will display (and sounds may play — *see Play Latching Sounds on page D-40*)

when the latching points of the selected objects are aligned or snapped to the latching points of unselected objects.



- **Latching:** Click on this check box to turn the Latching features on or off. Alternatively hold down the Control key and press the space bar to switch Latching on or off.
- **Latch Bounding Box:** Click on this check box to activate the eight corners of each object's bounding box as latching points.
- **Latch Mid Points:** Click on this check box to activate the mid points of each object's bounding box as latching points, i.e. The points half way between the eight corner points of the bounding box.
- **Latch Hot Spots:** Click on this checkbox to specify that an objects 'Hot Spots' should be activated as latching points. Hot Spots are points in addition to the corners and mid points of an object's bounding box. These are automatically added to wall objects and can be added to door and window objects. Hot Spots are added to wall objects at the top and bottom of the wall at each corner. When placing doors and windows in a document, the Windows and Doors palette includes a check box allowing you to choose whether to add Hot Spots or not. If added, Hot Spots are positioned at the points where the window or door intersects with the wall.
- **Multiple Latch Lines:** If this option is checked on, latch lines will display for all current alignments. If checked off, latch lines will display only for the first alignment found in each axis.
- **Play Latch Sounds:** Check this option on to play sounds according to the latching status of objects being positioned. Three different sounds play in the following circumstances:

  If a point is aligned with, but not snapped to, another point.

If a point is snapped to another point.

If a point in no longer aligned with or snapped to another point.

- **Latching Line Color:** Click on this box to display the Color Picker and select the color used to display the latching lines.

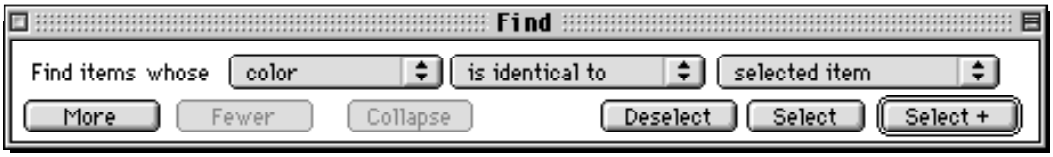
### 3D Cursor

- **Show Cross Hairs:** Check this option to display cross hairs showing the position of the cursor in the document in 3D space.
- **Floating Cursor:** The cursor defines a position and an orientation for entering new objects, and usually snaps to the surface of any object below the cursor arrow. Check this option to specify that the cursor should not snap to the surface of any object below it, and should not orientate itself in relation to that surface.

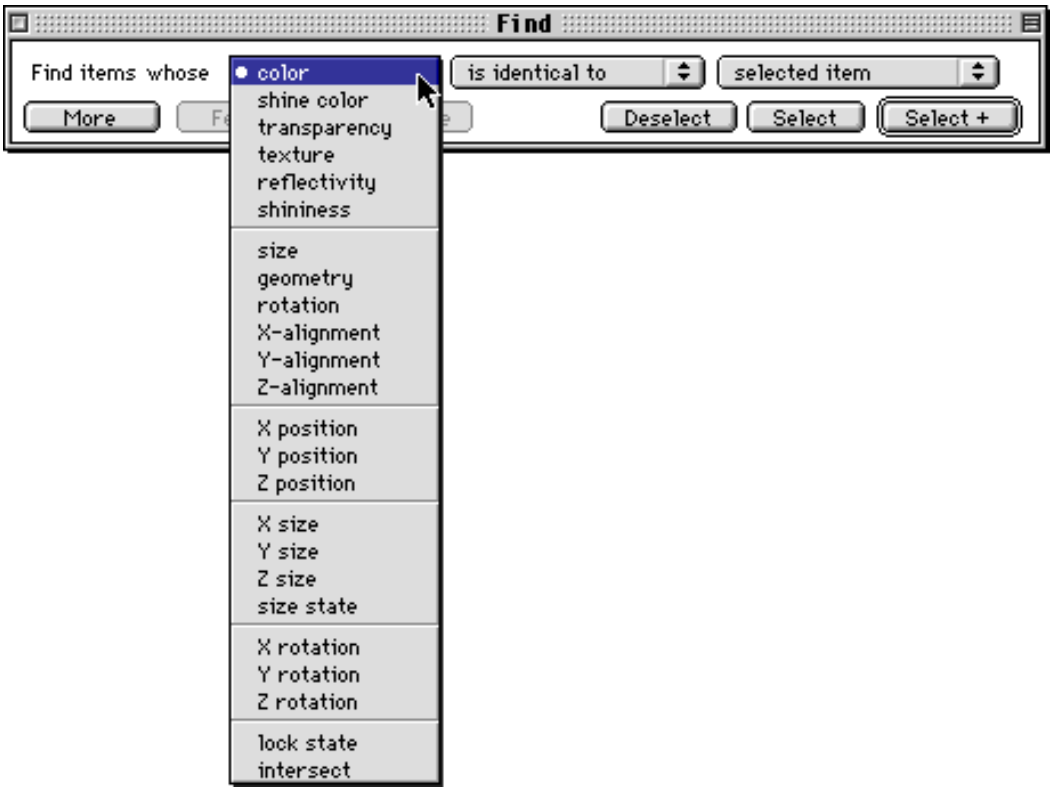
## ◆ Find

Use the Find palette to find objects in the document by object characteristics.

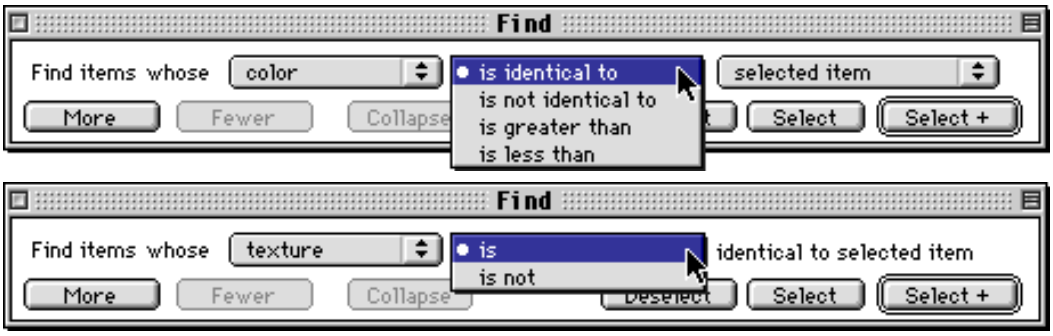
Select Find from the Palettes menu to display the palette:



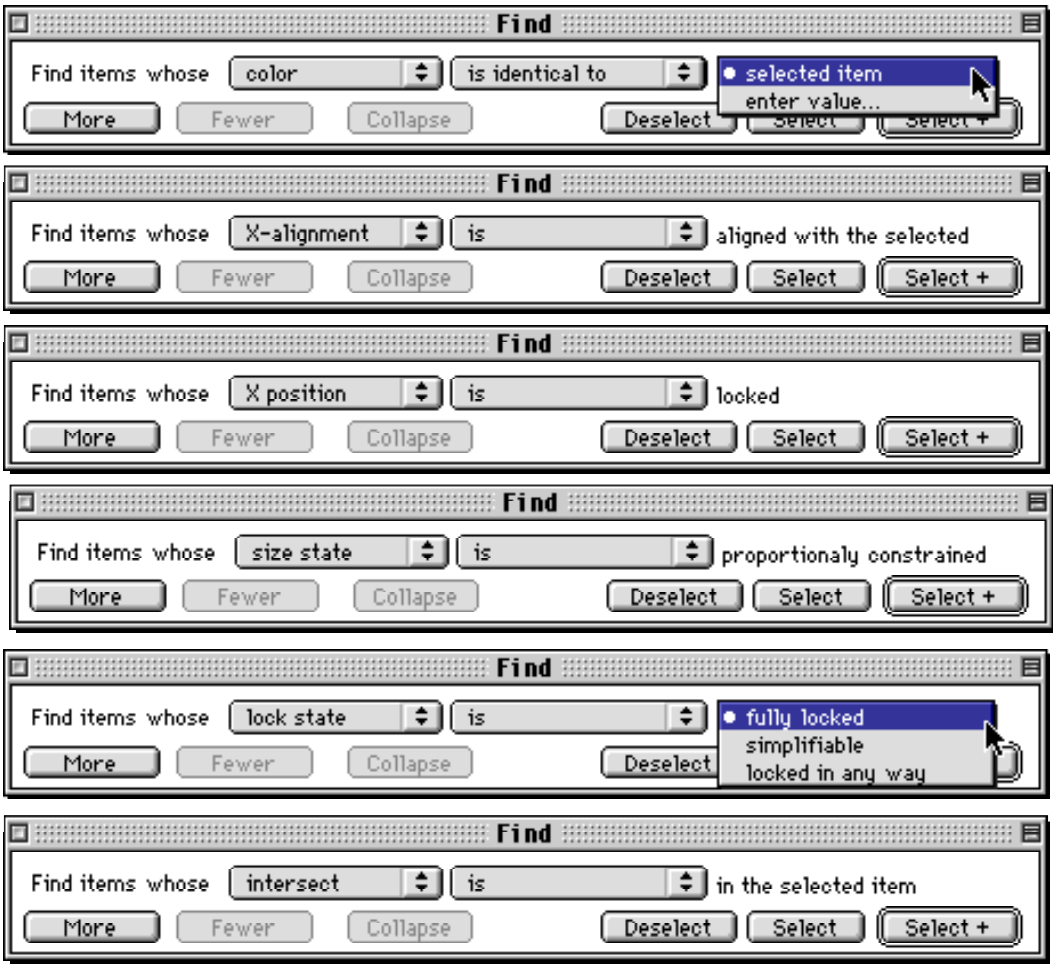
Select the object characteristic you wish to search for from the first popup menu:




Select a state for the characteristic from the second popup menu. The options available in will depend on the characteristic chosen:

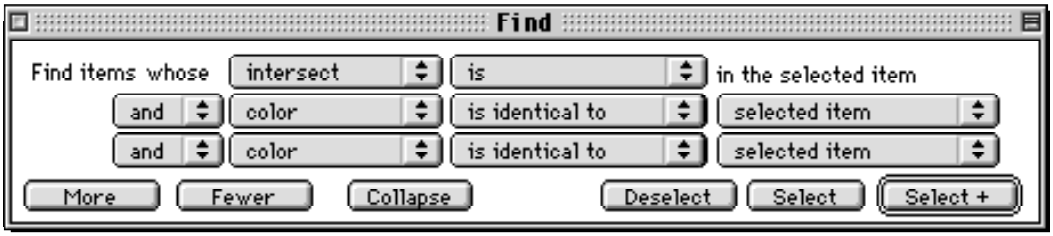


A third popup menu may be available. Again the options available will depend on the characteristic selected. Select a condition or choose to enter a value from this popup menu:


Find
Find items whose color is identical to
selected item
enter value...
More Fewer Collapse Deselect Select Select +
Find
Find items whose X-alignment is aligned with the selected
More Fewer Collapse Deselect Select Select +
Find
Find items whose X position is locked
More Fewer Collapse Deselect Select Select +
Find
Find items whose size state is proportionaly constrained
More Fewer Collapse Deselect Select Select +
Find
Find items whose lock state is
fully locked
simplifiable
locked in any way
More Fewer Collapse Deselect
Find
Find items whose intersect is in the selected item
More Fewer Collapse Deselect Select Select +

Further characteristics for the object can be selected by extending the palette. The three buttons at the bottom left of the palette control the palette display.

- Click More to display further options.


Find
Find items whose intersect is in the selected item
and color is identical to selected item
and color is identical to selected item
More Fewer Collapse Deselect Select Select +

- Click Fewer to display less options.
- Click Collapse to reduce the palette to a single line.

The three buttons at the bottom right of the palette are used to specify whether the found items are selected or not:

- Click Deselect to remove found items from the current selection.
- Click Select to select only the found items.
- Click Add to add the found items to the current selection.

When the palette is extended to allow more than one object characteristic to be chosen, a popup menu with the options ‘and’ and ‘or’ is available to the left of the second and any subsequent characteristic popup menus. The ‘and’ option has a higher search priority than ‘or’.

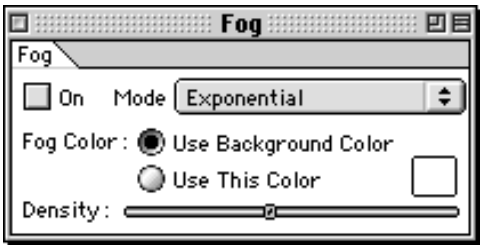
- Select ‘and’ to narrow the focus of the search by specifying that an object must fulfill both requirements.
- Select ‘or’ to widen the focus of the search by specifying that on object must fulfill one or other of the requirements.

## ◆ Fog

Use the Fog plug-in palette to add a specified fog effect to a scene.

**Note:** This plug-in requires QuickDraw 3D 1.6 to be installed and running.

Select Fog from the Palette menu to display the Fog palette:




### On

Click on the checkbox in the top left corner of the palette to turn the Fog effect on and off.

### Mode

Select the type of fog to apply to the scene by choosing one of the options in the Mode popup menu. Fog is calculated in relation to the near and far clipping planes, with maximum density at the far clipping plane and zero density at the near clipping plane. The mode selected will affect how quickly the fog becomes dense as you move away from the near clipping plane. *See Clipping Plane on page D-32 for more details.*

- **Linear:** Fog becomes dense at a constant rate as distance from the near clipping plane increases.
- **Exponential:** Fog becomes dense at a faster rate as distance from the near clipping plane increases.
- **Exponential$^2$:** Fog becomes dense at an even faster rate as distance from the near clipping plane increases.

### Fog Color

- **Use Background Color:** Click on this radio button to specify that the fog should be the same color as the document's background color.
- **Use This Color:** Click on this radio button to specify that the fog color should be a color other than the document's background color. Click on the square field to the right of this option to choose a color to use from the color wheel.

### Density

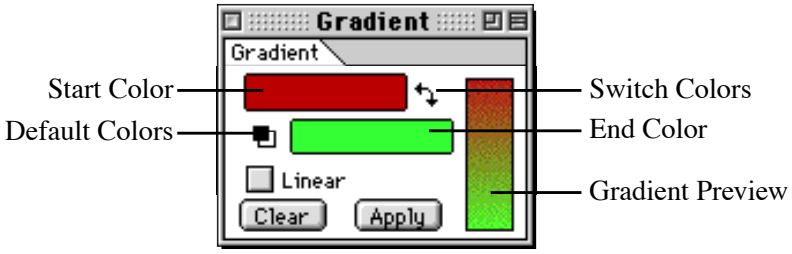
Use the Density slider to specify the maximum density of the fog. This will determine the density of the fog at the far clipping plane and hence affect how the fog density is calculated at the various points between the near and far clipping planes.

**Note:** Fog only affects objects within the document, between the near and far clipping planes. It does not affect the document background.

## ◆ Gradient

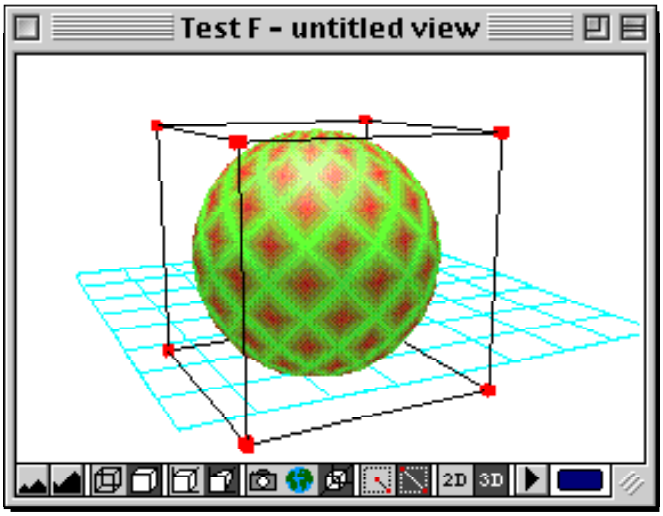
Use the Gradient palette to apply color gradients to the surface of objects. This is more efficient and uses less memory than applying a texture of a gradient to an object.

Select Gradient from the Palettes menu to display the palette:

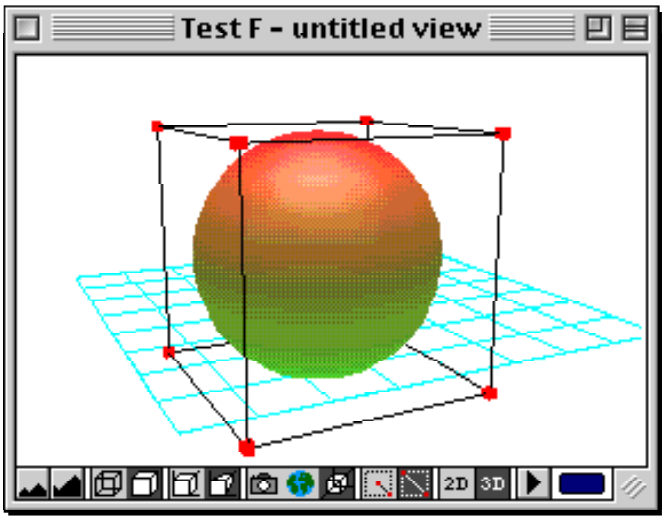



- Click on the Start Color button to select a color from the standard color picker to start the gradient with.
- Click on the End Color button to select a color from the standard color picker to end the gradient with.
- Click on the Switch Colors icon to switch the colors with which to start and end the gradient.
- Click on the Default Colors icon to reset the start color to black and the end color to white.

Select an object in the 3D World document and click on the Apply button. The gradient is applied between each of the vertices of the object:



To apply a linear gradient to an object, select an object, click on the Linear check box in the Gradient palette and click on the apply button The gradient will be applied to the object as a whole.




To clear the gradient from an object, select the object and the click on the Clear button in the Gradient palette.

## ◆ Group Special

The Group Special palette is used to produce further copies of a selection and apply transformations to the copies based on the original selection's size and position.

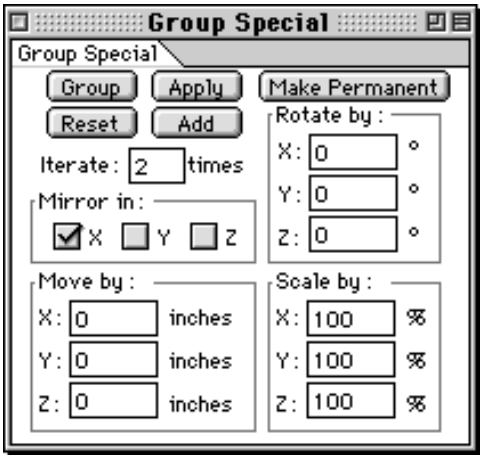
The original selection and its copies are placed in a group. As long as the group remains intact, the additional copies will remain identical to the original selection. This means that if the original selection is edited in any way, each copy will also be updated to reflect the changes made. *See Editing Group Special Objects on page D-58 for more details.*

As Group Special objects use relatively little disk space compared to identical objects made up of several normal 3D World geometries, it makes sense to use the Group Special palette to create objects made up of multiple identical components. Also, if the object components need to be changed, it should be much simpler to edit a Group Special object.

Positioning objects is very important as different results will be produced for the same options in the Group Special palette depending on the position of the original selection. *See Positioning Objects on page D-60 for more details.*

### The Group Special Palette

Select Group Special from the Palette menu to display the Group Special palette.



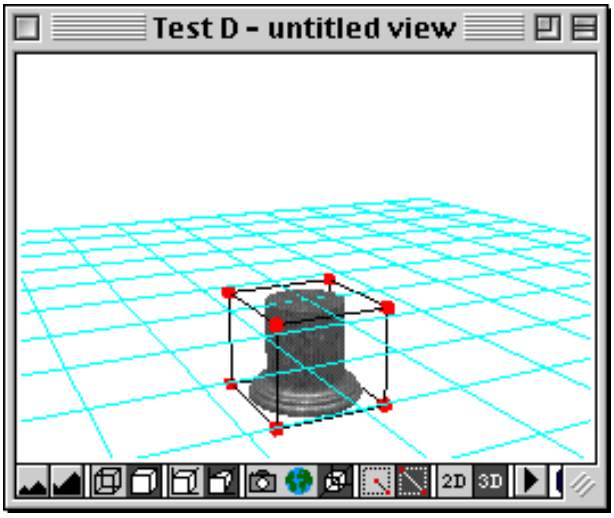

Group Special options are performed on a selected object, or several selected objects, in your 3D World document.

#### Iterate

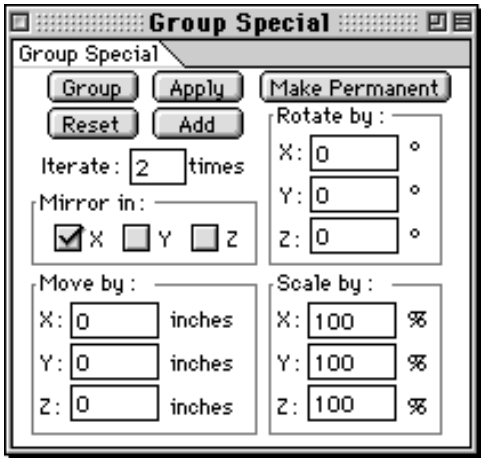
Enter a value in the Iterate field to specify how many copies of the selection should be transformed and displayed (including the original selection).

### Mirror

1. Select an object or objects in your 3D World document window. In the figure below, the object has been carefully positioned just under the center of the grid.

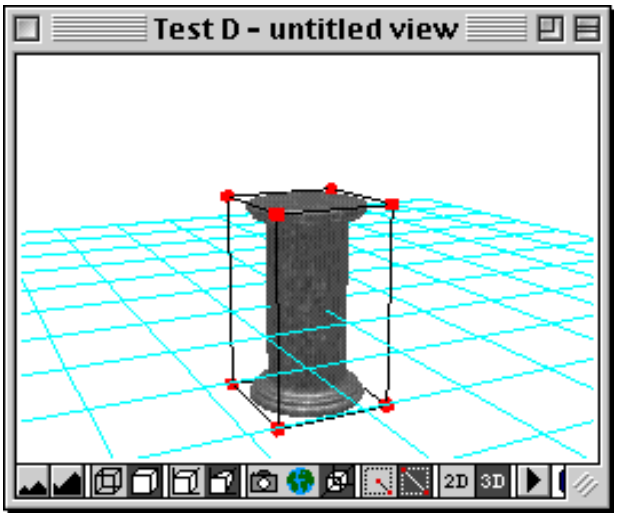



2. Click the Reset button in the Group Special palette to clear any existing settings.
3. Check the Y checkbox in the Mirror section of the palette. (Any or all of these checkboxes can be checked at the same time.)
4. Enter a value in the Iterate field. Note that a value more than 2 will result in copies being placed in the exact locations of the original and second copy, and so will not be visible.




5. Click on the Group button.

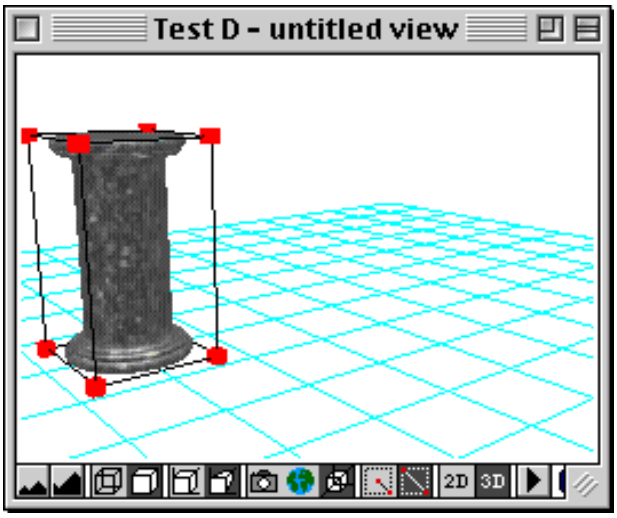
6. A group is created containing the original selection and one copy, so there are two copies in total. The copy is placed in the same location as the original selection as far as the x and z coordinates are concerned, but is mirrored in the y dimension.




Mirror transformations are performed in relation to the grid origin. If the object in the above example had been positioned 12" below the grid, its mirrored copy would have appeared 12" above the grid, and the 'pillar' would not have joined in the middle.

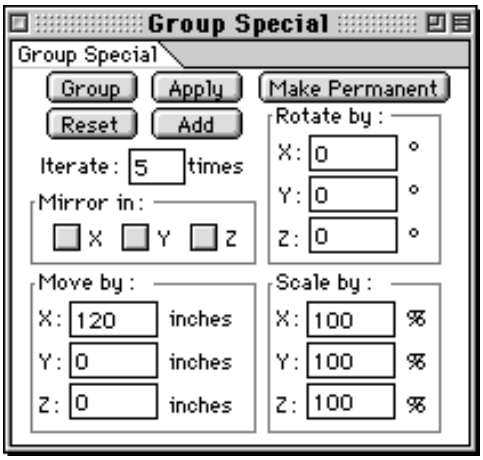
**Move**

1. Select an object or objects in your 3D World document window.

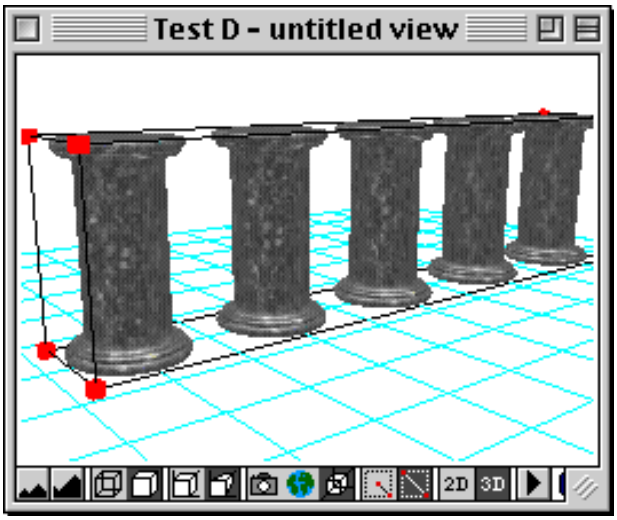



2. Click the Reset button in the Group Special palette to clear any existing settings.

3. Enter values to move the copied objects by in the x, y and z fields in the Move section of the palette. Suitable values will depend on the current grid settings.
4. Enter a value in the Iterate field.




5. Click on the Group button.
6. The original selection is copied so that the total number of copies (including the original) is the same as the Iterate value. Each copy is moved from the previous copy by the values specified. The objects are grouped together.

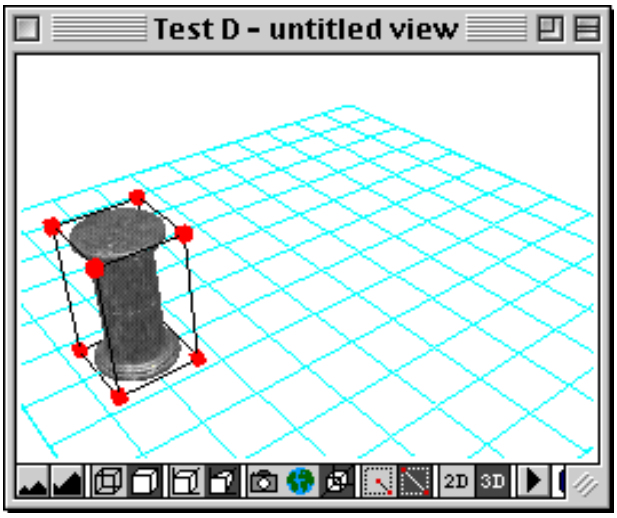



In the above example, the original object was the pillar produced in the Mirror example, so the Move/Group Special command was performed on an object that was already a Group Special object. The basic component is still the half pillar, which can be edited.

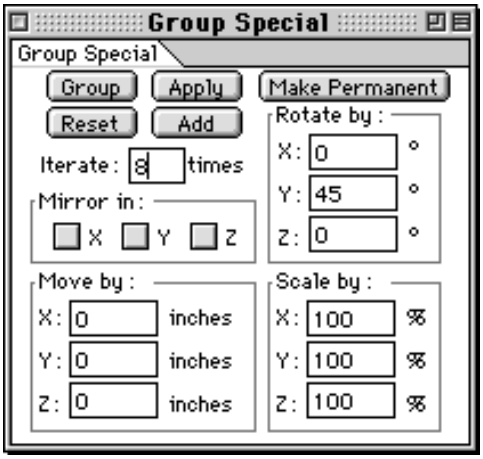
In this case the tops and bottoms of all five pillars would be updated to reflect the changes made.

**Rotate**

1. Select an object or objects in your 3D World document window:

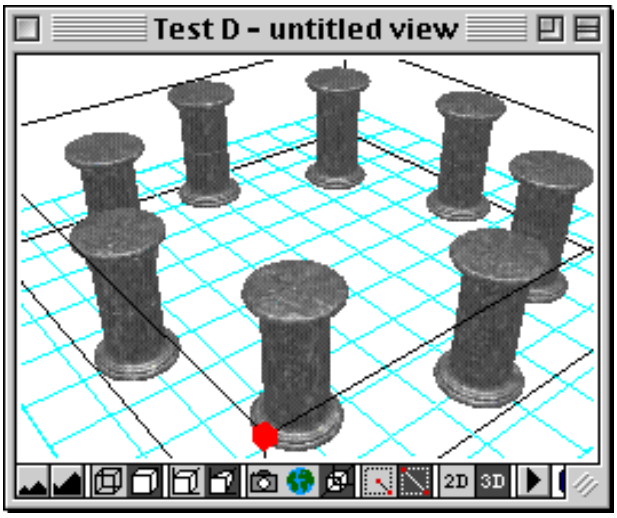



2. Click the Reset button in the Group Special palette to clear any existing settings.
3. Enter values, in degrees, to rotate the copied objects by in the x, y and z fields in the Rotate section of the palette.
4. Enter a value in the Iterate field.



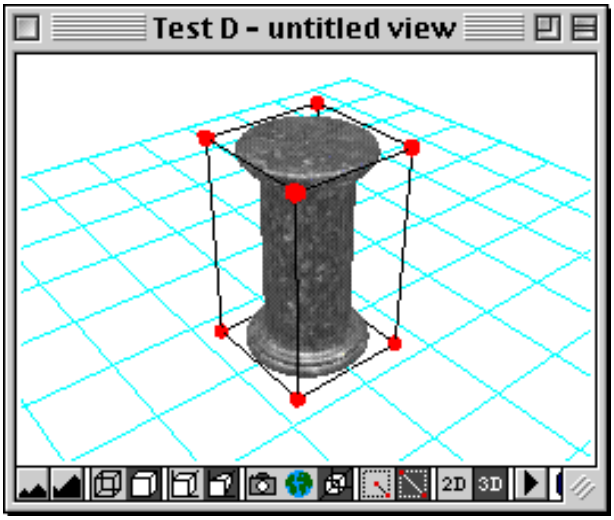

5. Click on the Group button.

6. The original selection is copied so that the total number of copies (including the original) is the same as the Iterate value. Each copy is rotated around the relevant axis, by the specified number of degrees from the previous copy. The objects are grouped together.



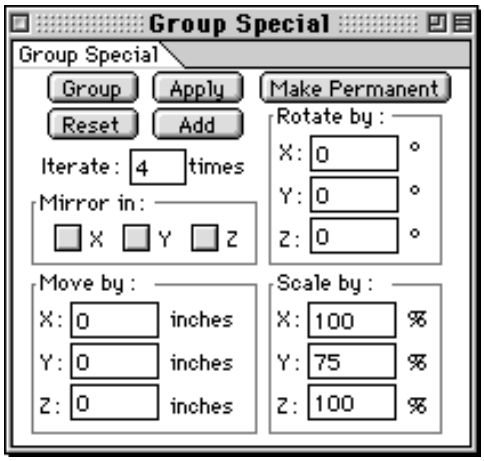

**Scale**

1. Select an object or objects in your 3D World document window. This object has been carefully positioned standing on the center of the grid.

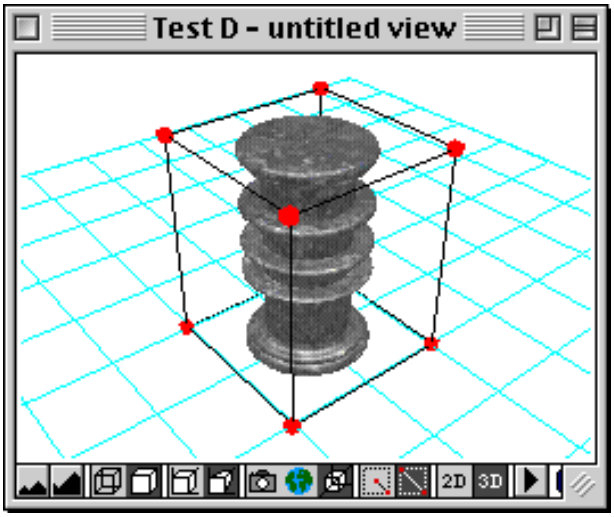



2. Click the Reset button in the Group Special palette to clear any existing settings.
3. Enter percentage values to scale the copied objects by in the x, y and z fields in the Scale section of the palette. A setting of 100% does not result in a transformation.

4. Enter a value in the Iterate field.

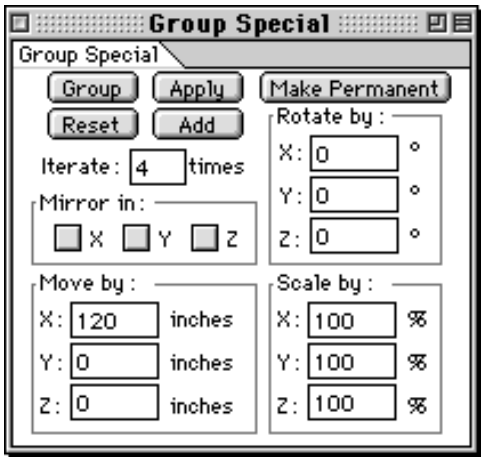



5. Click on the Group button.
6. The original selection is copied so that the total number of copies (including the original) is the same as the Iterate value. Each copy is scaled in relation to the previous copy by the values specified. The objects are grouped together. As the original object was placed on the center of the grid, the copies are placed in the same location, if the original object had been placed away from the center of the grid, the position of each copy would be determined by the scale values for each axis.

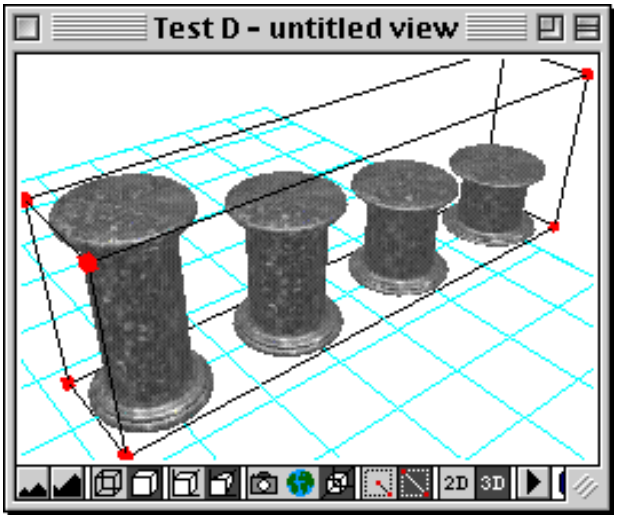



7. Click on the Reset button in the Group Special palette to clear the settings in the palette.

8. Enter values to move the copied objects by in the x, y and z fields in the Move section of the palette. Suitable values will depend on the current grid settings.




9. Click on the Add button to add the new transformation to the existing Group Special object.
10. The copied objects are positioned according to the values specified.




**Group**

The Group button creates a new group determined by the original selection and the settings in the Group Special palette.

#### Apply

The Apply button applies transformations to an existing group, based on the settings in the Group Special palette, and overwriting the existing transformation.

#### Add

The Add button applies transformations to an existing group, based on the settings in the Group Special palette, in addition to the existing transformation.

#### Reset

The Reset button clears the settings in the Group Special palette.

#### Make Permanent

The Make Permanent button is used to add the transformed copies to the document as individual objects. The copies will now be clones of the original object. Clones share the same basic geometry and surface attributes as the original which means that if the geometry, color, transparency, shininess etc. of the original is changed, any clones will also be changed, and if a clone is changed, other clones and the original will be changed. The clone link relates to the basic geometry and surface attributes only. Changes in size, position and rotation will not be reflected by clones. The objects will still appear as a group.

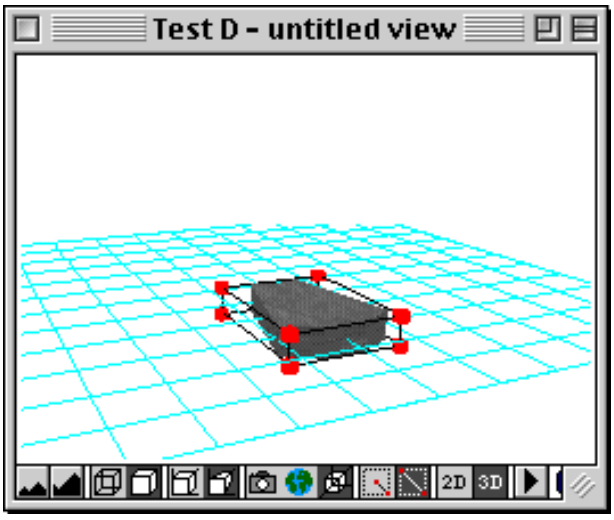
Using the Ungroup command produces the same result as using the Make Permanent button, but the objects are also ungrouped.

### Multiple Transformations

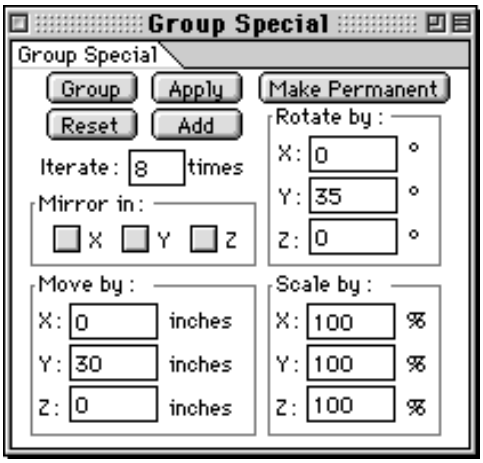
Multiple transformations can be applied to a selection at the same time.

1. Draw a step shaped object in your 3D World document.

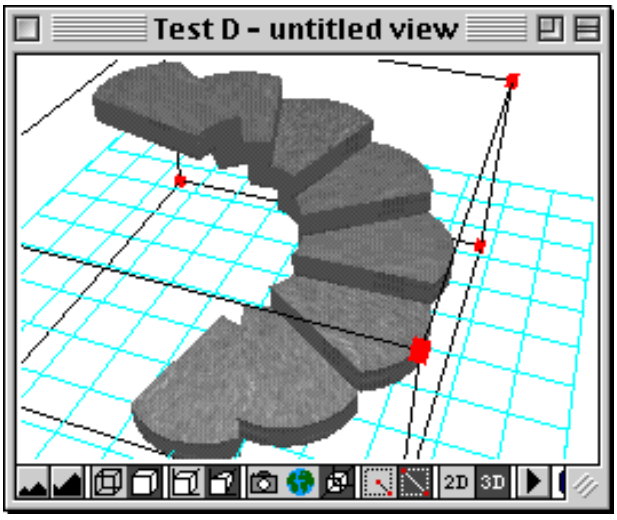
2. Position it at coordinates x = 0, y = 0, and position your step in the z dimension so that one end is set slightly away from the origin.




3. Click on the Reset button in the Group Special palette to clear the settings in the palette.
4. Enter a value in the Iterate field to specify the number of steps to be created.
5. Enter a value in the y field in the Move section to specify the distance above the previous step that each step should be placed.
6. Enter a value in the y field in the Rotate section to specify the number of degrees that each step should be rotated around the y axis.



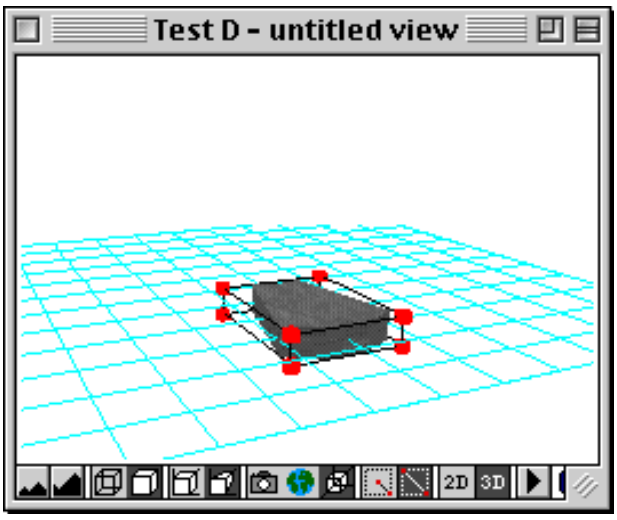
7. Click the Group button to produce a spiral staircase.



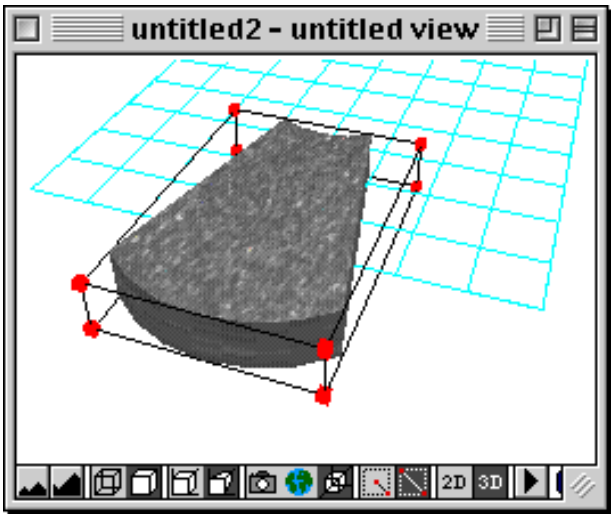

### Editing Group Special Objects

Double-click on a Group Special group, or select it and choose Edit Item from the Options menu. An editing window opens containing only the original object(s) from the Group Special group. The original selection can now be edited, in any way, and each of its copies will be updated to reflect the changes made.

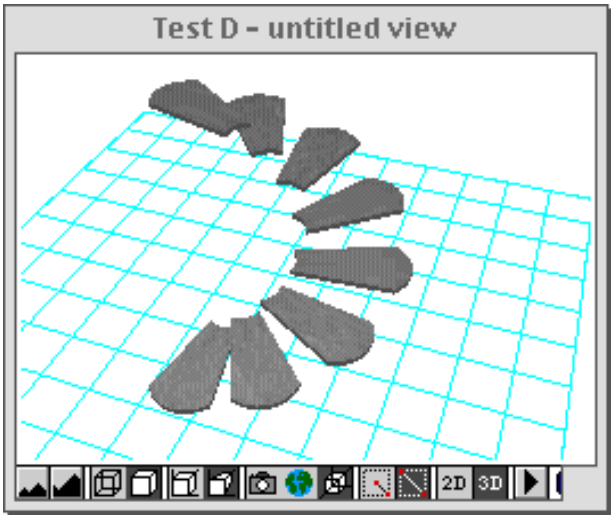
1. Double-click on the spiral staircase created in the previous example.
2. An editing window opens containing only the original step:



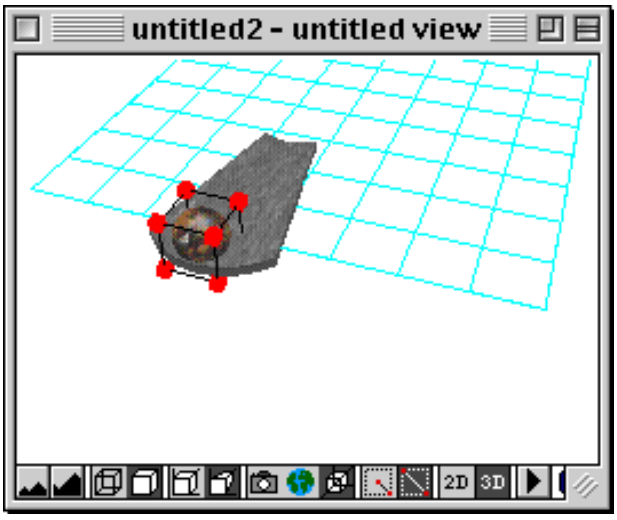
3. Click and drag on the handles of the object's bounding frame to adjust its size:



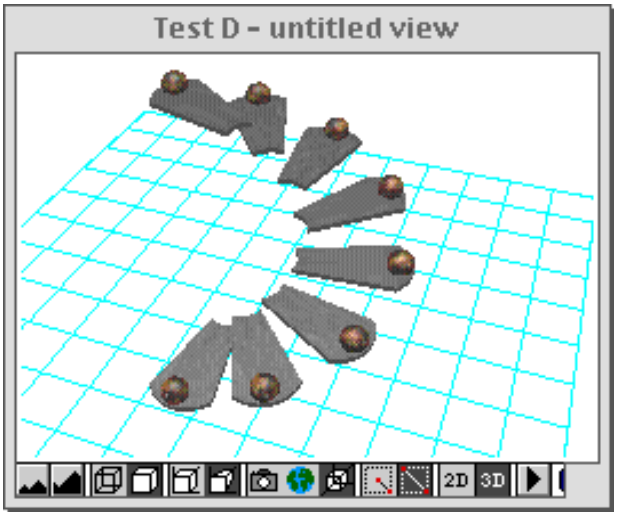

4. Notice that in the main document window, all the steps in the staircase have changed:



5. In the editing window, draw a sphere and place it at the edge of the step:




6. Again, notice that in the main document window, the sphere has been added to each step:




### Positioning Objects

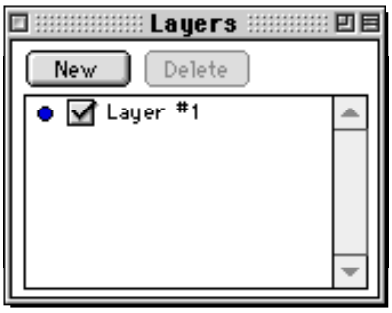
It is very important to position the original object(s) carefully, before using the Group Special palette options, as the results produced will vary depending on the position of the original selection. For this reason it is recommended that you create each Group Special object in a new 3D World document, setting the Grid Options as per the requirements of this particular object.

The original object(s) should be carefully positioned in relation to the center of the grid before producing a special group, as the Mirror, Rotate and Scale transformations are all calculated with respect to the grid origin. Once the group is created, the object can be moved or placed in the master 3D World document and its position relative to the grid origin is no longer relevant.

## ◆ Layers

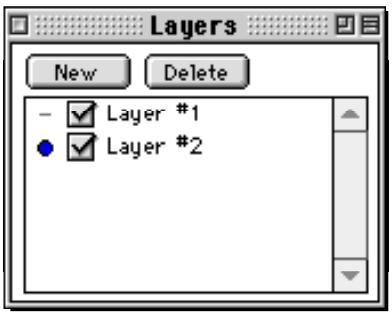
Multiple layers can be created in your 3D World document using the Layers palette. Objects can then be placed on specific layers and hidden or displayed as required.

Select Layers from the Palettes menu to display the palette:




The layer that is currently active is marked by a blue circle. Any new items created are added into the active layer, even if the Layers palette is not open. The checkbox next to the layer name is used to display or hide the layer.

- **To add a new layer:** Click on the New button. A new layer is added. It is visible and becomes the active layer. The previous layer remains visible but is no longer active.



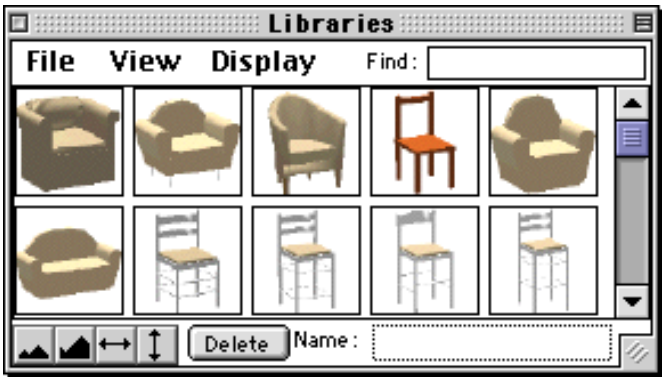
- **Selecting items:** Only items in the currently active layer can be selected. Clicking on items which are not in the active layer will have no effect and they will not be selected.
- **To make a different layer the active layer:** Click on the dash to the left of the layer name and checkbox. If items were selected in the previously active layer, they will automatically be deselected. Note: When items or files are dragged and dropped into a 3D World document they will be added to the active layer regardless of whether they already have layer information attached to them.
- **To move items to a different layer:** Select the items, hold down the Shift key and select a different layer to become the active layer. The selected items will be moved to the new active layer.
- **To move items to a new layer:** Select the items, hold down the Shift key and click on the New button. The selected items will be moved to the new layer. Alternatively, cut or copy items from a layer, change the active layer and select paste. The items will be added to the active layer.
- **To hide a layer:** Uncheck the check box next to its name. The items in that layer will remain in the document, but will not be drawn on the screen. Note: the active layer is always visible and cannot be hidden.
- **To show a layer:** Check the check box next to its name.
- **To change the name of a layer:** Double click on the layer's name. Enter a new name in the dialog that displays and click OK.

- **To delete a layer:** Make the layer to be deleted the active layer and click on the Delete button. The layer will be deleted and the next existing layer will become the active layer. Note: A layer that contains objects cannot be deleted.

## ◆ Libraries

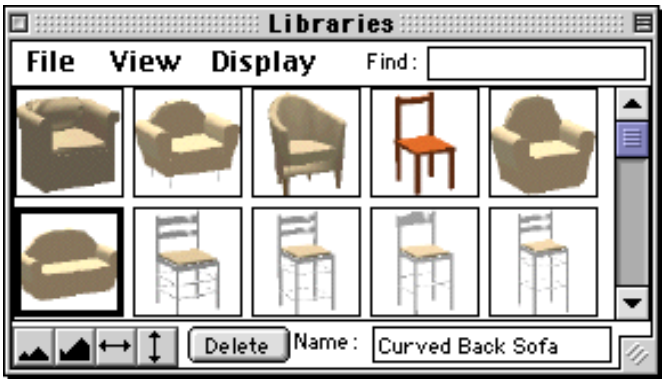
The Libraries palette displays libraries of furniture items, doors, windows, textures etc. that can be used in your 3D scene.

Select Libraries from the Palette menu. The Libraries palette opens and contains any library files currently in the plug-ins folder:




### Selecting Library Items

When you click on an item that is stored in a library it will be outlined with a black rectangle to show it is selected:



### Storing Data

3DMF, PICT, QuickTime movie, sound data, and data in various other image formats can be stored in libraries. To store your own items in a library, drag and drop objects/groups of objects from 3D World into a library.

### Naming Items

Items are displayed in a library in the order in which they were entered.

If an item has a name attached to it, this name is displayed in the Name field at the bottom of the palette when the item is selected. Unnamed items will display as untitled.

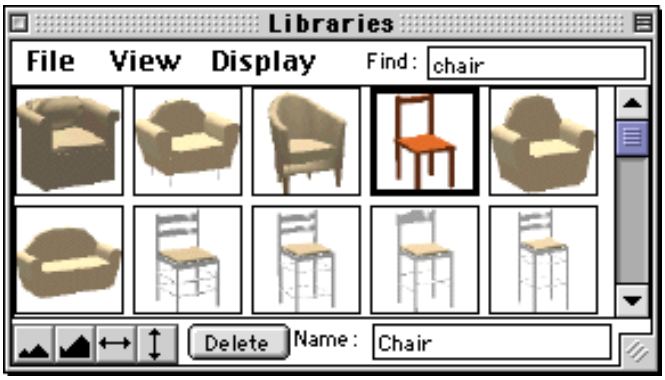
To name or rename an item, select its icon and enter a name in the Name field. Press the Enter or Return key, select another object or click on an empty space in the library and the item will be updated with its new name.

### Retrieving Data

To retrieve data from a library, drag and drop an item directly into your 3D World document.

### Find

Library items can be searched for by name. Enter text into the Find field at the top right of the Libraries palette. The first item found that matches the entered text will be selected:

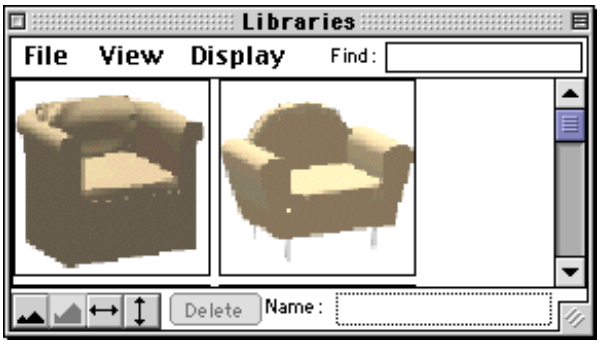


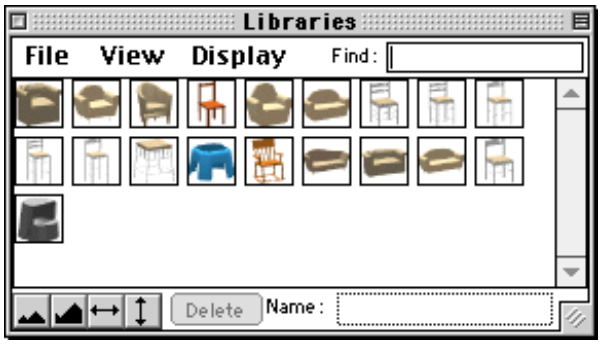

**Note:** The Libraries palette searches for names that match or start with the name you enter.

### Window Controls

#### Zoom In/Out

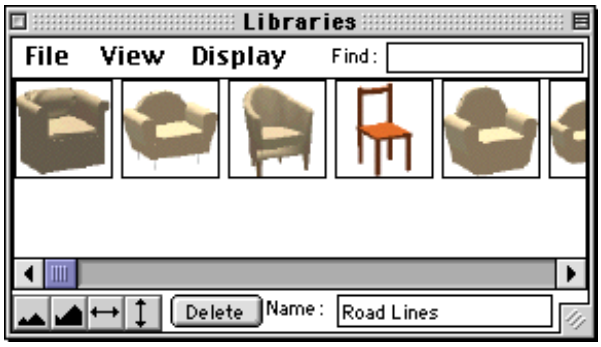
The Zoom controls at the bottom left of the palette can be used to increase/decrease the size of the palettes contents:

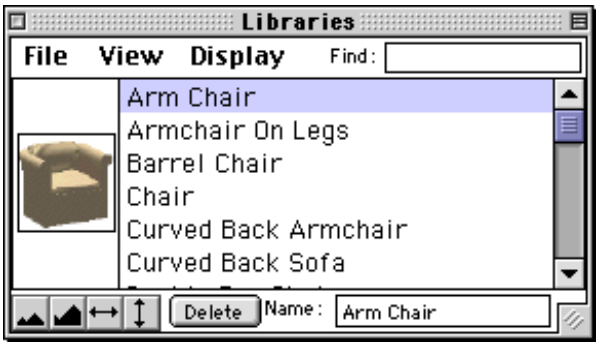


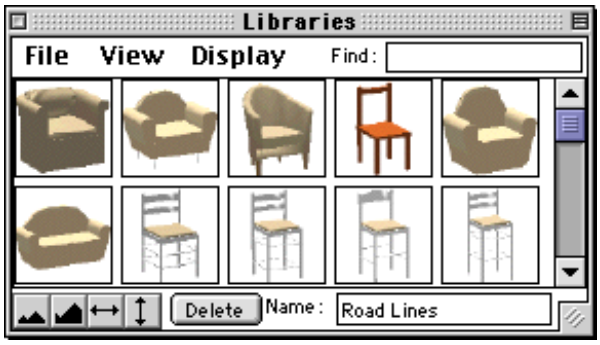

#### Horizontal/Vertical Arrows

- **Horizontal Arrow:** In the By Icon view, click on this button to display the Libraries palette with a horizontal scroll bar. In the By List view, click on this button to display the preview to the left of the item list:



- **Vertical Arrow:** In the By Icon view, click on this button to display the Libraries palette with a vertical scroll bar. In the By List view, click on this button to display the preview above the item list:

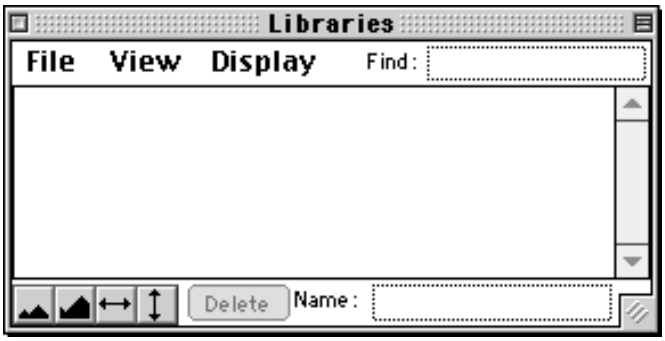


## Menus

### File Menu

#### New

Select New to open a new library. The standard dialog will display, allowing you to enter a name for the new library and specify a location to save it. A new, empty library will display in the Libraries palette:



#### Open

Select Open to open an existing library. A standard Open dialog will display for you to select the library to open. The selected library will display in the Libraries palette.

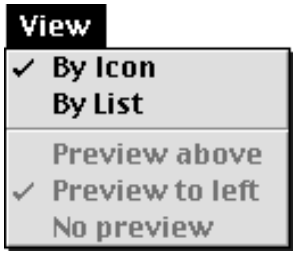
#### Close

Choose to close the current library. The Auto Save feature saves the library file whenever you add data, so you do not need to save any changes. The Libraries palette will remain open and will display the contents of any other open libraries.

#### Close All

Choose to close all open libraries. The Libraries palette will remain open but will be empty.

### View Menu




#### By Icon

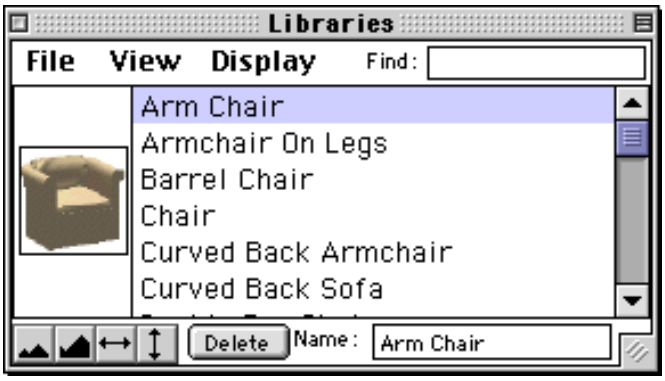
Select By Icon from the View menu to display picture previews of a library's contents. Although the items' names will not be displayed, you may still search for items by name using the Find field at the top right of the Libraries palette. Librarian will display a preview of each item unless there is insufficient memory to create one. If Librarian recognizes the data type, a standard data type icon will display. If Librarian does not recognize the data type, an unknown data type icon will display.

#### By List

Select By List from the View menu to list a library's contents by name. When By List is selected you can also choose whether to see a preview of an item when it is selected in the list.

• Preview above: The preview is displayed above the list:

• Preview to left: The preview is displayed to the left of the list:



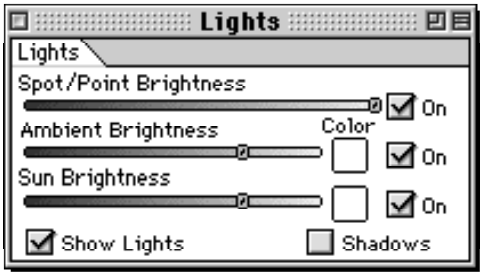

• No preview: No preview of selected items is displayed:

### Display Menu

The display menu lists all the libraries currently open. Select a library's name from the list to display it or choose Show All to display the contents of all the open libraries in the order in which they were opened.

## ◆ Lights

The Lights Palette is used to control the various lighting features available in the application. Select Lights from the Palettes menu to display the palette:




**Note:** The Preferences dialog, accessed from the Edit Menu, contains a check box for Global Lights. If the Global Lights control is turned on, any changes made via the Lights palette will affect the whole document. If the Global Lights control is turned off, making changes in the Lights palette will affect only the current window. *See Preferences on page 3-24 for further details.*

### Spot/Point Brightness

Lights are placed in documents by dragging and dropping light objects or furniture items including lights into the document. When a light is placed in a document, its color, brightness, spread and sharpness can be adjusted via controls in the Info Palette. *See Info Palette on page 4-16 for further details.*

- To manipulate all point or spot lights at once, use the Spot/Point Brightness slider control in the Lights Palette.
- Use the checkbox to the right of the slider bar to turn all the point or spot lights on or off.

### Ambient Brightness

Ambient light is the equivalent of daylight. It is a diffused light that has no specific point of origin and casts no shadows.

- Use the Ambient Brightness slider bar to adjust the brightness of the ambient light.

- Click on the color box to display the Color Picker and select a color for the ambient light, or drag a color onto the color box.
- Use the checkbox to the right of the color box to turn ambient light on or off.

#### Sun Brightness

By default, sunlight shines from the South East at an angle of 45°. The direction of the sunlight can be adjusted using the Sun Direction plug-in. *See Sun Direction on page H-67 for further details.* Sunlight will affect your view of an object, and some surfaces will reflect more light than others.

- Use the Sun Brightness slider bar to adjust the brightness of the sunlight
- Click on the color box to display the Color Picker and select a color for the sunlight, or drag a color onto the color box.
- Use the checkbox to the right of the color box to turn sunlight on or off.

#### Show Lights

Use this checkbox to specify whether Point and Spot Light objects should be hidden or displayed. The effects of the lights will be apparent regardless. Non-interactive renderers (such as the Microspot Renderer) will not display light objects whether they are hidden or not. *See Appendix I — Microspot Plug-in Renderer on page I-1 for more details.*

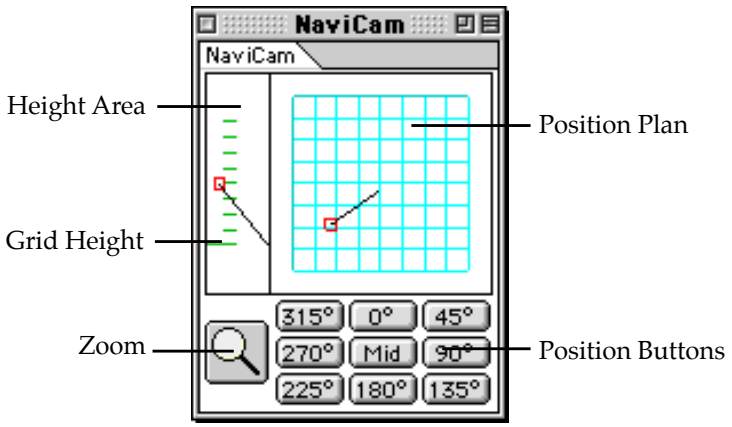
#### Shadows

These are not true shadows but projections of object shapes onto the grid. These are provided to help with the positioning and design of objects. The Shadows checkbox allows you to choose whether or not to display these shadows. Note that light settings have no effect on the display of shadows.

## ◆ NaviCam

The NaviCam palette provides a way of controlling the camera position and view.

Select NaviCam from the Palette menu to display the NaviCam palette.




The red square displayed in the palette, both in the height area and in the position plan, represents the camera. The line from this square shows the camera view direction and at the end of this line is the look at point or point of interest.

### Height

Use the controls in the Height Area to adjust the position of the camera, or point of interest, in the Y dimension.

The long green line in the Height Area represents the grid height. The lines above it represent height as determined by the size of the grid and each grid square.

- Click on the camera square and move it up or down to change the camera height while maintaining the point of interest.
- Click on the view direction line (or anywhere in the Height Area except the camera square) and drag up or down to change the height of the point of interest without changing the camera height. This is the same as tilting the camera.
- Hold down the Option key, click anywhere in the Height Area and drag up or down to adjust the height of the camera and move the point of interest relative to the camera height.

If the camera is moved out of the height range shown, the display will be rescaled so that the camera square can still be seen. When the camera is moved back into range, the display will be rescaled again.

#### Position

Use the controls in the Position Plan to adjust the position of the camera or the point of interest in the X and Z dimensions.

The Position Plan displays an image of the 3D scene in plan view.

- Click on the camera square and drag to change the position of the camera while maintaining the point of interest.
- Click on the view direction line (or anywhere in the Position Plan except the camera square) and drag to change the position of the point of interest without moving the camera position. This is the same as turning the camera.
- Hold down the Option key, click anywhere in the Position Plan and drag to move the camera and move the point of interest relative to the camera position. This is the same as the step and crab movements of the camera.

If the camera is moved out of the plan shown, the display will be rescaled so that the camera square can still be seen. When the camera is moved back into range, the display will be rescaled again.

#### Zoom

Click on the Zoom button and drag up or down to zoom in or out on the scene.

#### Position Buttons

Use the position buttons to move either the camera or the point of interest to predefined positions.

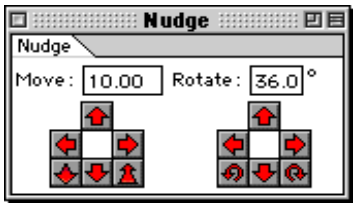
- Click on the position buttons to move the camera while maintaining the point of interest. 0° moves the camera to directly behind the point of interest, 90° to the right, 180° directly in front of, 270° to the left, and so on.
- Hold down the Option key and click on the position buttons to move the point of interest while maintaining the camera position. 0° moves the point of interest to directly behind the camera, 90° to the right, 180° directly in front of, 270° to the left, and so on.

- Click on the ‘Mid’ button to move both the camera and the point of interest to predetermined locations. The point of interest is positioned at the centre of the grid. The camera is placed half way between the centre and the side of the grid, directly in front of the point of interest. The camera will be at approximately eye height and tilted down slightly.

## ◆ Nudge

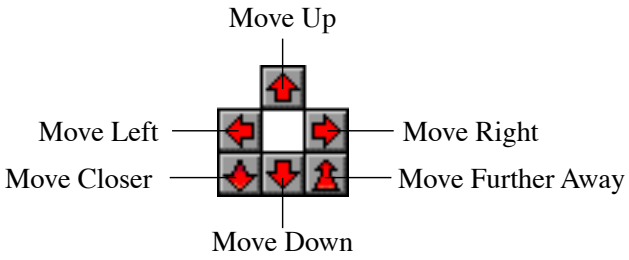
Use the Nudge palette to move or rotate an object by a specified amount.

Select Nudge from the Palettes menu to display the Nudge palette:



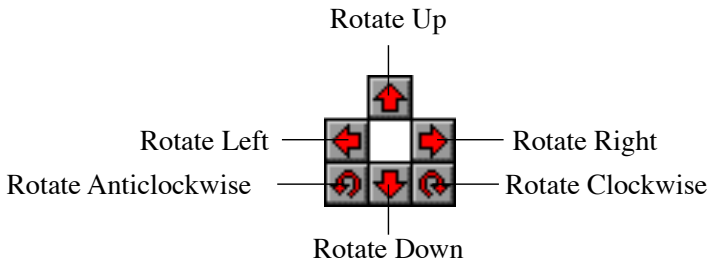

### Move

1. Select an object in the document window.
2. Enter a value in the Move box in the Nudge palette. The units used will depend on those set for the document in the Options menu. *See Options Menu on page 3-34 for further details.*
3. Click on the control buttons to choose the direction in which to move the selected object. The direction relates to the current view.



**Rotate**

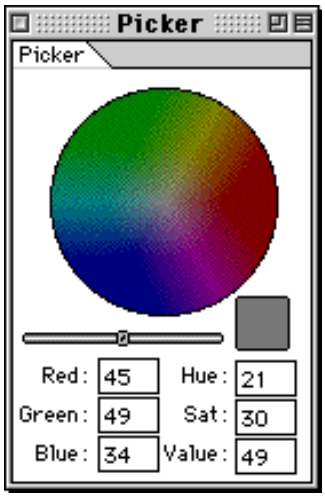
1. Select an object in the document window.
2. Enter a value in degrees in the Rotate box in the Nudge palette.
3. Click on the control buttons to choose the direction in which to rotate the selected object. The direction relates to the current view.




## ◆ Picker

The Picker plug-in displays a color picker, so that an object's color or the default color can be changed easily.

1. Select Picker from the Palette menu to display the Picker palette:




2. To change the color of an object, several objects, or a group, make a selection in the document window. If nothing is selected, the default color will be changed.

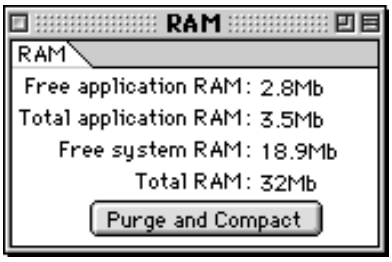
3. Choose a color from the Picker palette by clicking on the color wheel and/or adjusting the brightness slider bar and values for Red, Green, Blue, Hue, Saturation and Value.
4. Click on the current color button to display the system color picker(s) if necessary.

**Note:** Colors can be dragged to and from the current color button.

## ◆ RAM

The RAM plug-in is used to display the memory usage of 3D World and the amount of free system RAM available.

Select RAM from the Palettes menu to display the RAM palette:

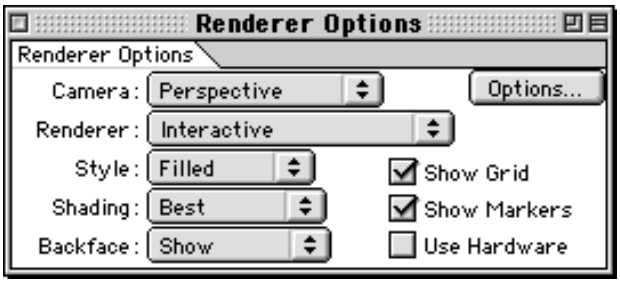



- **Free application RAM:** The amount of RAM allocated to, but not currently used by, 3D World. It is recommended that this amount stay above 500k to maintain the application's performance.
- **Total application RAM:** The amount of RAM allocated to 3D World. This may be the same as the amount allocated to 3D World via the Get Info dialog, but is affected by whether Virtual Memory is turned on or off.
- **Free system RAM:** The amount of RAM not currently in use by the system or any other application. QuickDraw 3D uses free system RAM, so this amount will decrease as your 3D model grows in size, or if additional applications are launched. It is recommended that this amount stay above 1Mb and an alert will display warning you when this point is reached.
- **Total RAM:** The amount of total physical RAM installed in the computer. This value is not affected by Virtual Memory.

- **Purge and Compact:** Click on the Purge and Compact button to purge unused memory and compact the rest of the memory so that one contiguous block of free RAM remains. It affects only the application's memory partition, so use this button if you are running short of free application RAM. The amount showing in the RAM palette for Free application RAM may not change when this button is used, but the difference will be seen if you look at the RAM usage with a RAM usage application.

## ◆ Renderer Options

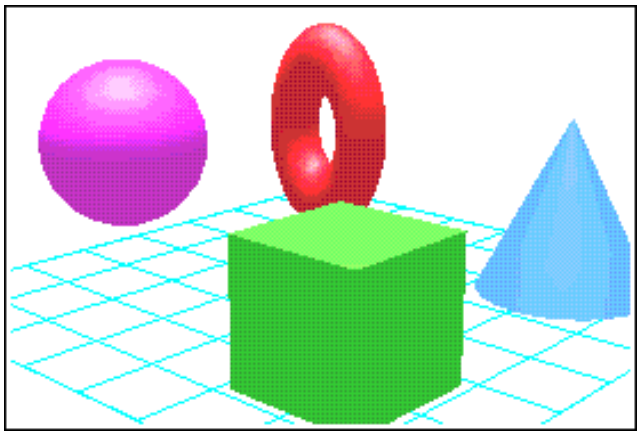
The Renderer Options plug-in palette is used to control the way that the document is displayed. Choose Renderer Options from the Palettes menu to open the palette:



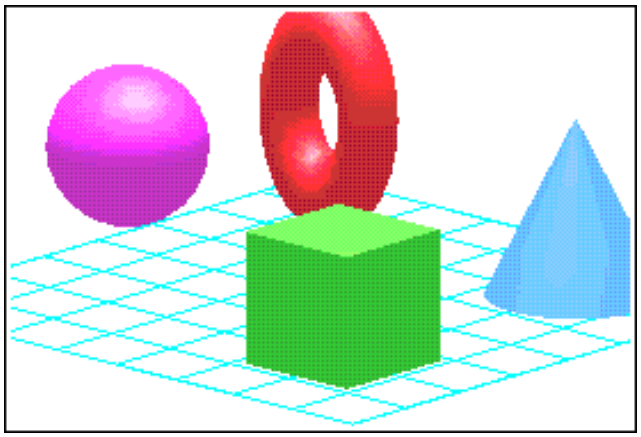
### Camera

Select Perspective or Orthographic from the Camera pop-up menu.

- **Perspective:** Objects are displayed in perspective mode to give the illusion of depth. Parallel lines are drawn so that if extended, they would converge at a given point:



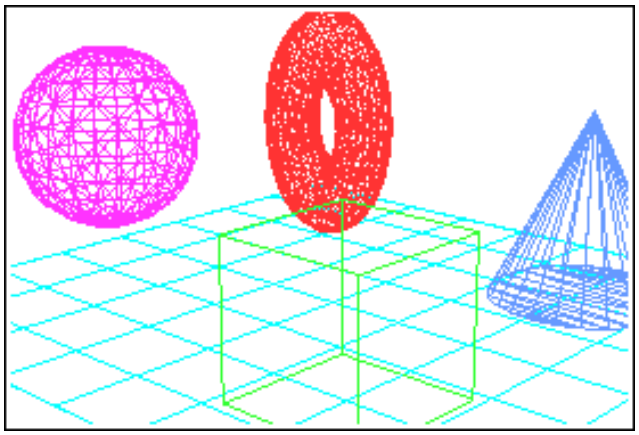
- **Orthographic:** Objects are displayed in Orthographic mode. Parallel lines remain parallel, regardless of the distance they are supposed to be from the camera:



### Renderer

Click on the Renderer popup menu to display any available renderers. As QuickDraw 3D version 1.5 and later supports plug-in renderers, any plug-in renderers that are installed will be included in the list.

- **Wire Frame:** The surfaces of objects are not filled; only the edges of the surfaces are displayed:



- **Interactive:** Objects in the document are rendered using the QuickDraw 3D interactive renderer.
- **Microspot Renderer:** The scene is rendered using the Microspot non-interactive renderer to produce a high quality final render. *See Appendix I — Microspot Plug-in Renderer on page I-1 for more details.*

#### Renderer Options

To the right of the Renderer popup menu is a button for Renderer Options. This is only active if a non-interactive renderer is installed and selected. Click on the button to display any available options for the currently selected non-interactive renderer.

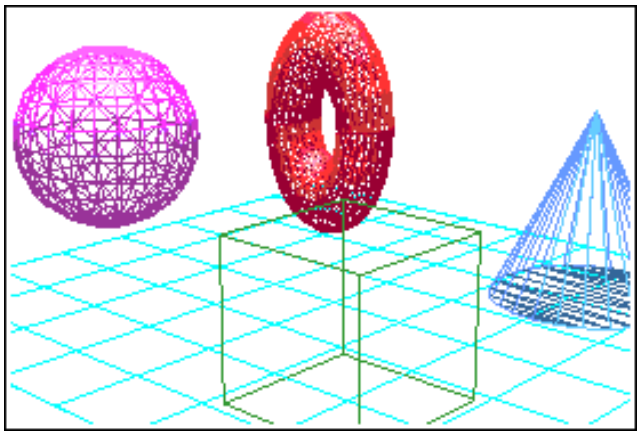
**Note:** Holding the Option key down while selecting the renderer will also display any options available.

### Style

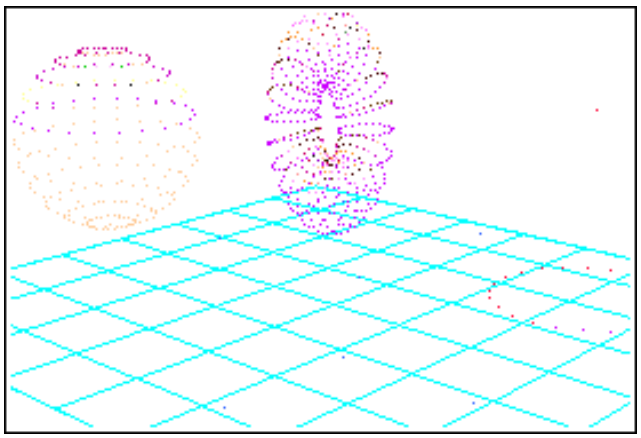
The Style pop-up menu is not available when the Wire Frame renderer is selected. Select one of the following options from the menu:

- **Filled:** All surfaces are filled and rendered. Objects appear to be solid.

- **Edges:** Only the edges of objects are rendered. This is different from Wire Frame mode in that lines are rendered according to the orientation of the object and any light sources, rather than the lines being displayed as one solid color:



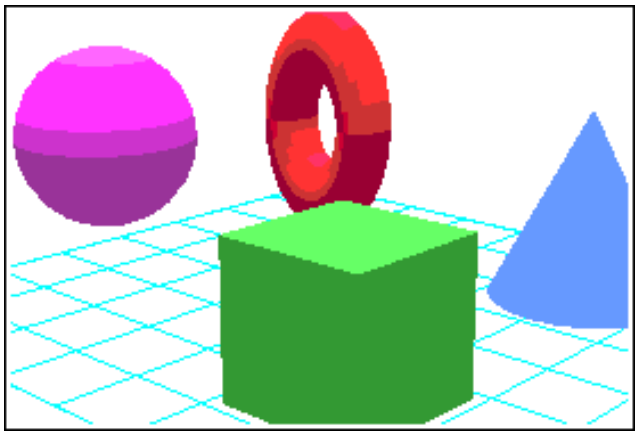
- **Points:** Only the vertex points of objects are rendered. Points are rendered according to the orientation of the object and any light sources:



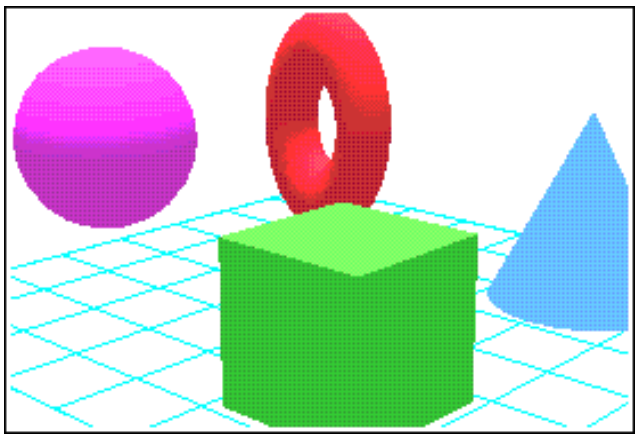
### Shading

Select Plain, Smooth or Best from the Shading pop-up menu.

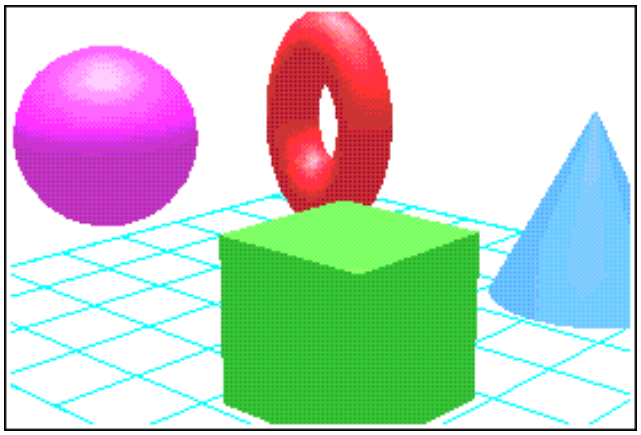
- **Plain:** Surfaces are filled but not smoothed and steps of color can be seen within some objects. Shading is applied according to the angle of the surface and any light sources that will affect the object:



- **Smooth:** Surfaces are filled and smoothed. Shading is applied according to the angle of the surface and any light sources that will affect the object:



- **Best:** Surfaces are filled and smoothed. Shading is applied according to the angle of the surface and any light sources that will affect the object. This option also displays the reflections of any lights:

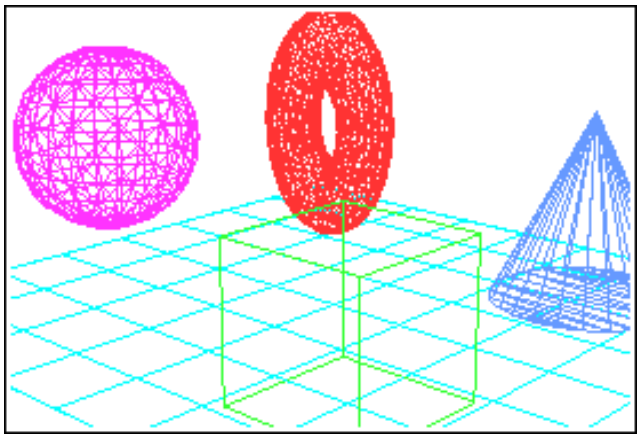


### Backface

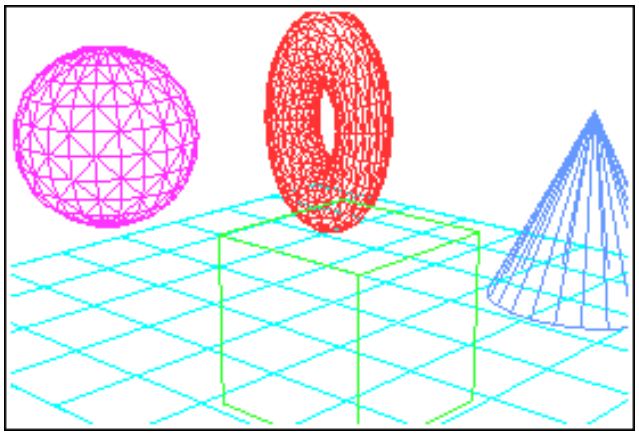
The backface of an object is the side that faces away from the camera.

Select Show, Remove or Flip from the pop-up menu.

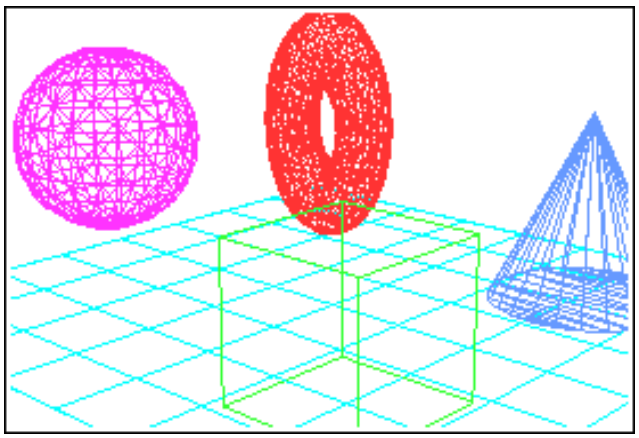
- **Show:** Select this option to show the backface of an object. This will not make any visible difference if the object surfaces are filled, but if you are viewing the objects in wire frame mode, you will be able to see the wire frame on the backface of the object:



- **Remove:** Select this option to hide the backface of an object. This will not make any difference if the object surfaces are filled, but if you are viewing an object in wire frame mode, its backface will not be displayed:



- **Flip:** The Flip option flips the backface so that the outside surface is now on the inside. This does not affect the shape of the object, but may alter the way it is rendered:



### Show Grid

Documents are automatically displayed with a grid to help you design and position objects in 3D. When this option is enabled, the grid will be displayed. Uncheck this option to hide the grid.

#### Show Markers

When text and sound markers are placed in a document, you can choose whether or not to display them. Check the Show Markers option to display markers, or leave it unchecked to hide markers.

#### Use Hardware

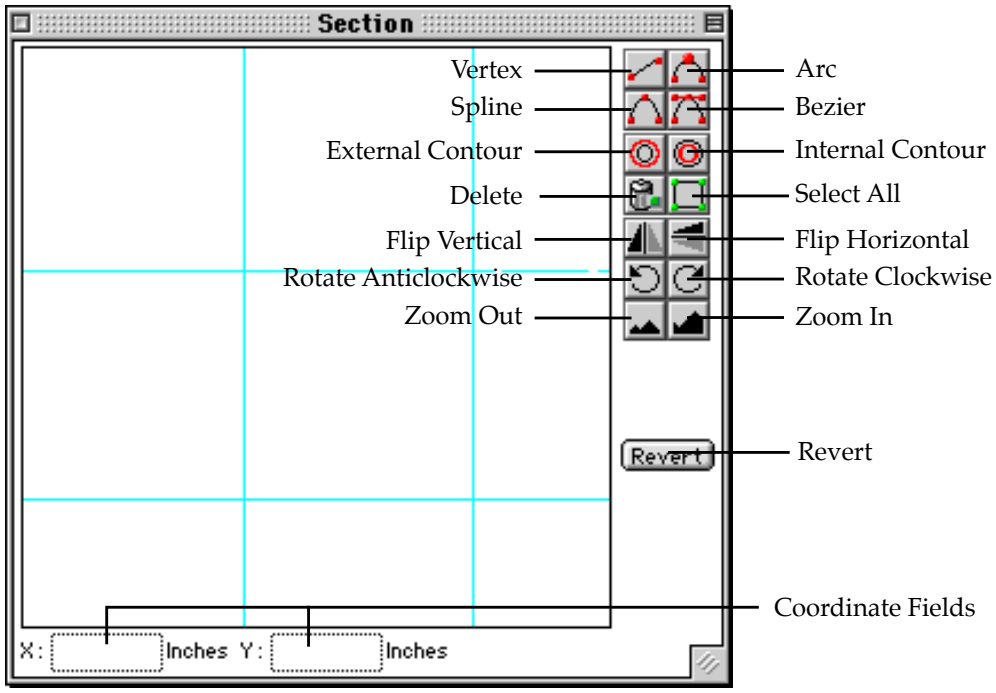
If you have a hardware renderer installed in your computer, check this box to specify that you want to use it.

## ◆ Section

The Section palette is used to edit the section of geometries that are made up of paths and sections. These are: 3D Text; cones; cylinders; extruded bitmaps; irregular polygons; lathed objects; pipes; pyramids; and regular polygons.

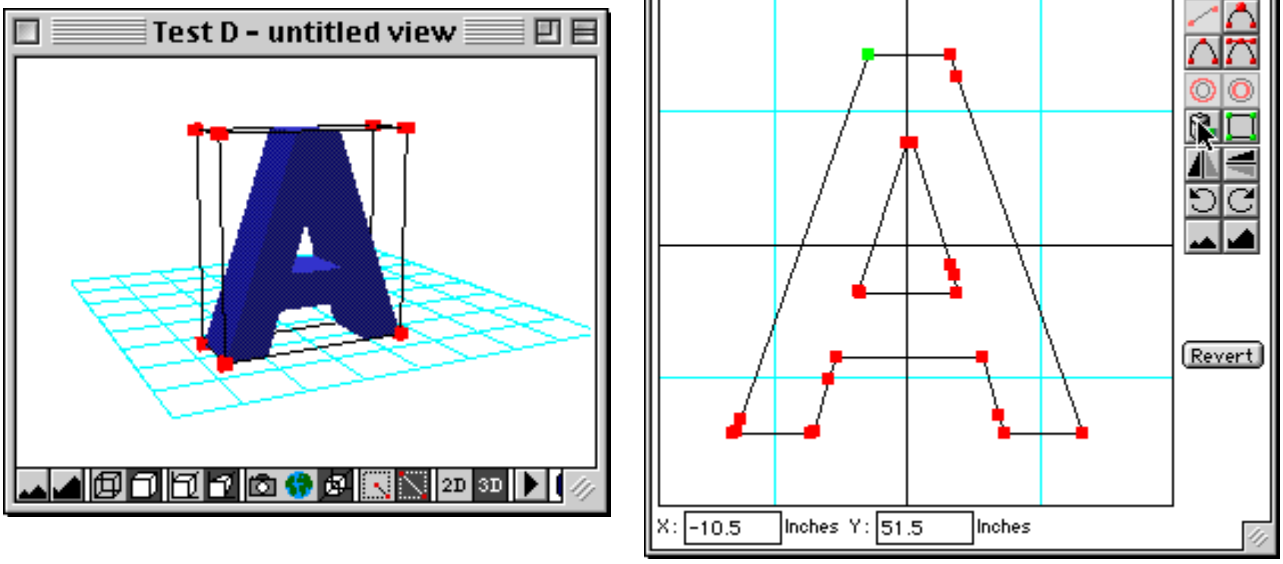
If the Dynamic Updates application preference is checked on, as the section is edited the geometry in the 3D World document window is updated to reflect the changes made and the results of any actions can be seen instantly. If the Dynamic Updates preference is checked off, the geometry in the 3D World document window is updated only when the mouse button is released as an editing action is completed. *See Options on page 3-25 for further details.*

To display the Section palette, select Section from the Palette menu:



### Displaying An Object Section

Select a geometry in the document window and its section will display in the Section palette. The section is drawn in black with handles showing the various points on the section. Black lines show the x and y axes, and the object origin is at the point these two axes intersect.




### Types Of Point

- **Vertex:** A standard point used to define the beginning or end of a straight section of a path or line.
- **Arc:** A point on a section of a circle defined as the center point on the arc between two vertex points.
- **Spline:** A point on a curve. The curve is defined automatically and cannot be edited except by adjusting the points at either side of the spline point.
- **Bezier:** A point on a curve. Two Bezier handles allow the curve to be adjusted.

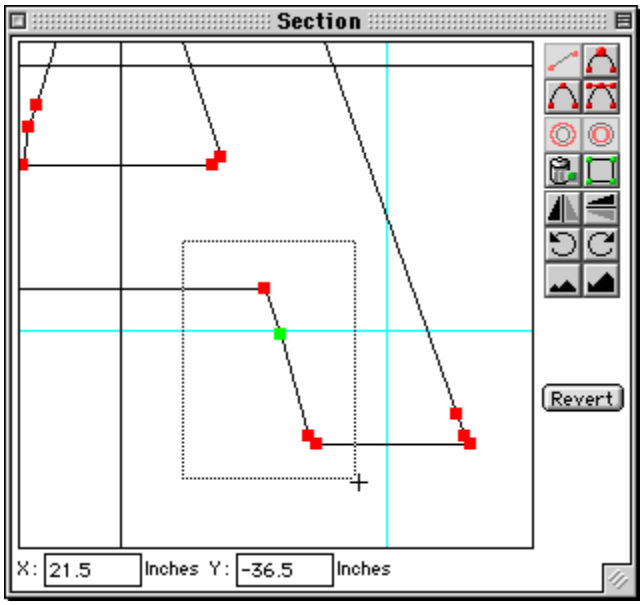
Vertex point handles display as squares, Bezier and spline point handles as diamonds, and arc point handles as circles.

### Selecting Points

Click on a handle to select it.

**Note:** When selected, a Bezier point has two additional handles that allow you to adjust the Bezier curve.

- **To select additional points:** Hold down the Shift key and click on another point.
- **To deselect points:** Hold down the Shift key and click on a selected point.
- **To select several points at the same time:** Hold down the Shift key and click and drag in the Section palette to drag out a marquee selection:

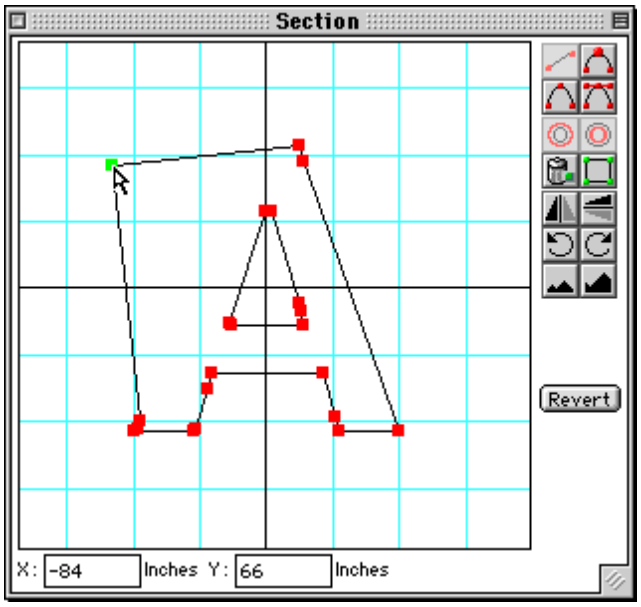



- **To select all the points in the section:** Click on the Select All button in the Section palette.

### Moving Points

There are three methods of moving points of any type:

- Click on a handle and drag to reposition it.




- Enter coordinate values in the x and y fields at the bottom of the Section palette to move a point by precise values. The coordinates entered here relate to the section origin rather than the grid origin.
- Use the arrow keys to move a point by two screen pixels at a time, or by the grid snapping distance if one is set.

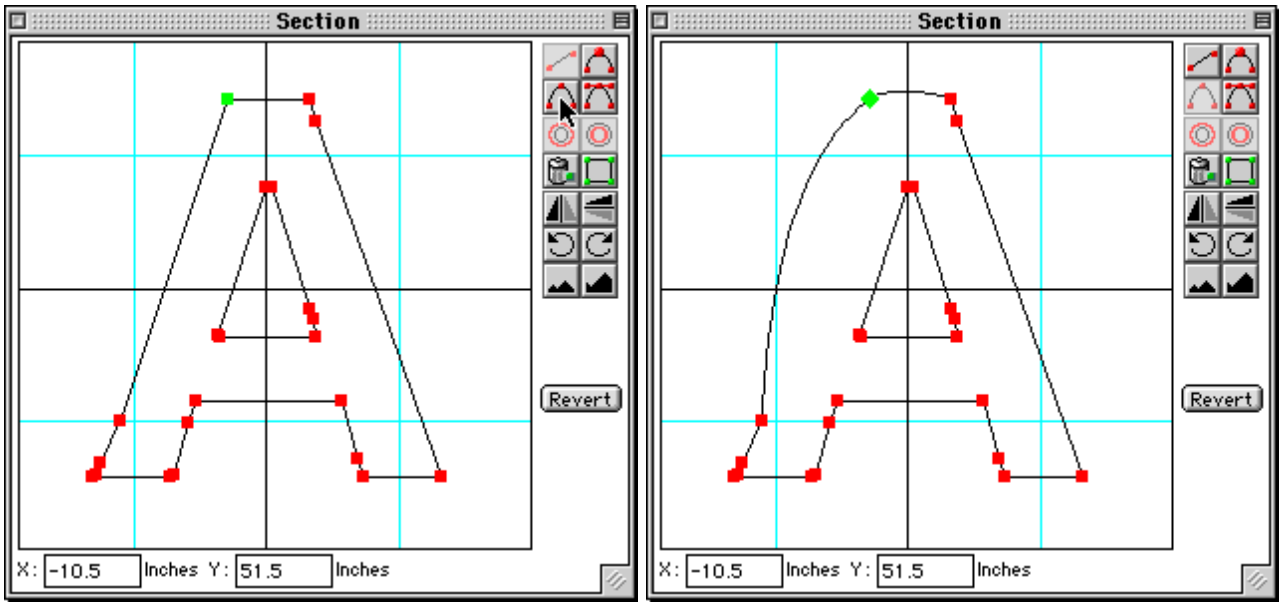
When moving points by clicking and dragging or using the arrow keys, the section window will autoscroll so that you can see the new position of the point(s).

### Manipulating Points

- **Arc:** Other adjustments can be performed by manipulating the vertex points at either end of the arc.
- **Bezier:** Click and drag on the Bezier handles to adjust the curve. Hold down the Option key and click and drag on the Bezier point or Bezier handles to break the Bezier curve.

### Changing Points

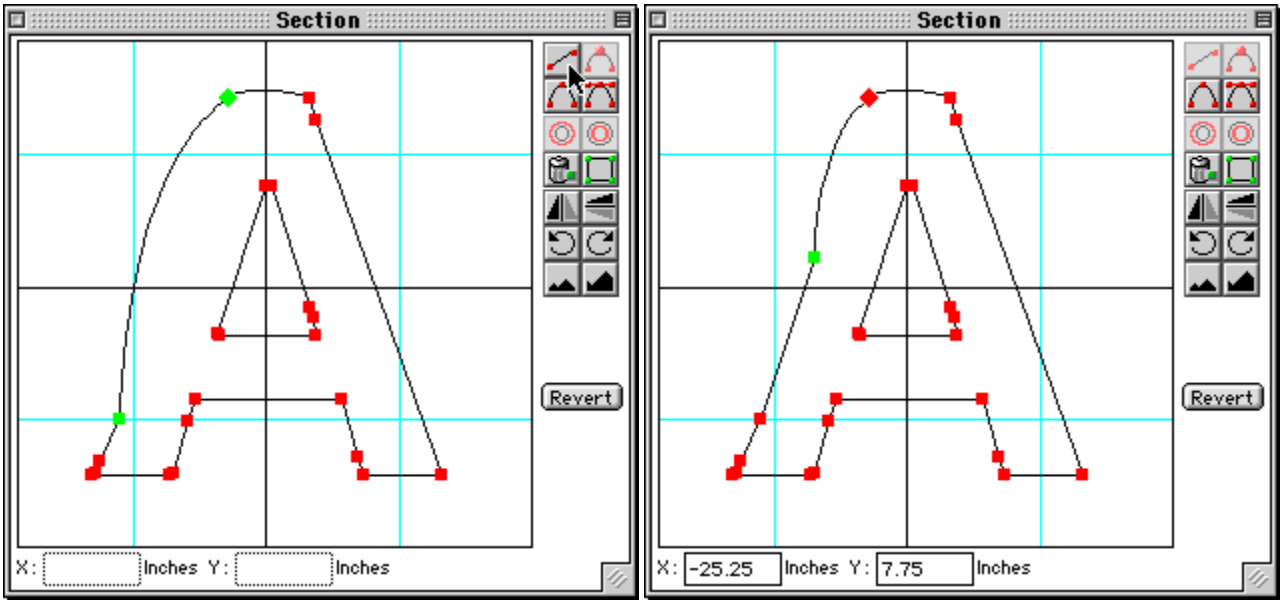
To change a point to a point of a different type, select the point then click on the Vertex, Arc, Spline or Bezier button in the Section palette. The point will change to the type selected.




**Note:** An arc point can only be added between two vertex points.

### Adding Points To A Section

To add a point to a section, select two contiguous points on the section, then click on the Vertex, Arc, Spline or Bezier button in the Section palette. A point of the appropriate type will be added between the two points originally selected.




**Note:** An arc point can only be added between two vertex points.

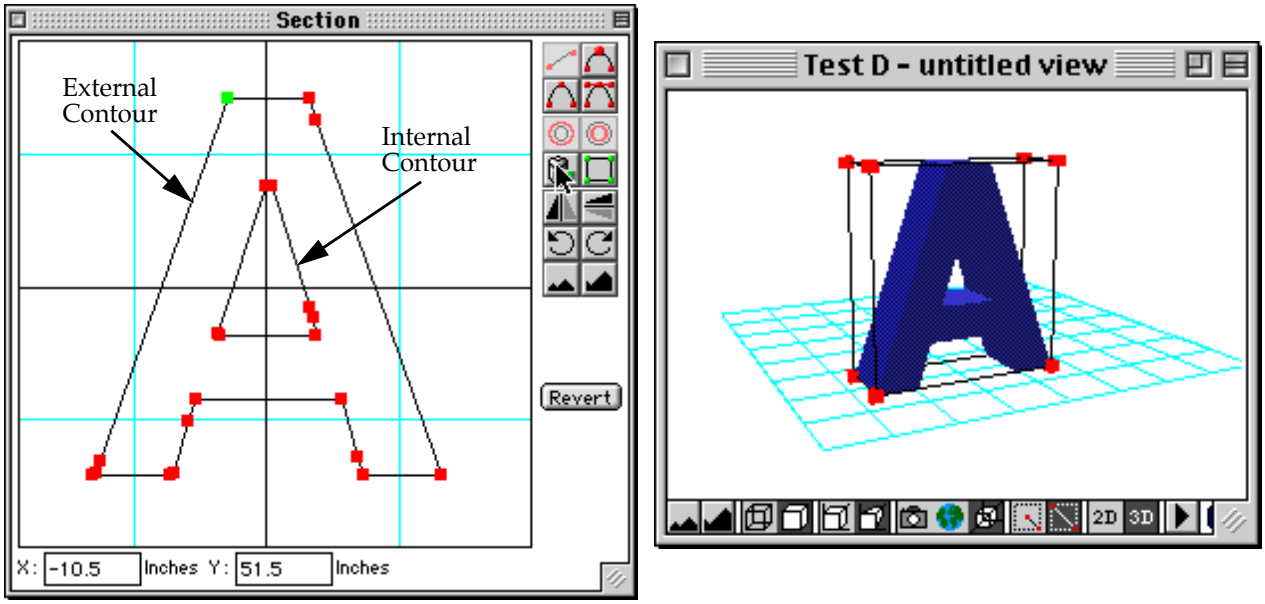
An alternative way of adding vertex or spline points is to hold down the Option key, click on an existing vertex or spline point and drag to place a copy of the point.

**Note:** Arc and Bezier points cannot be added in this way. Holding down the Option key and clicking and dragging on a Bezier point causes the Bezier curve to be broken.

### External/Internal Contour

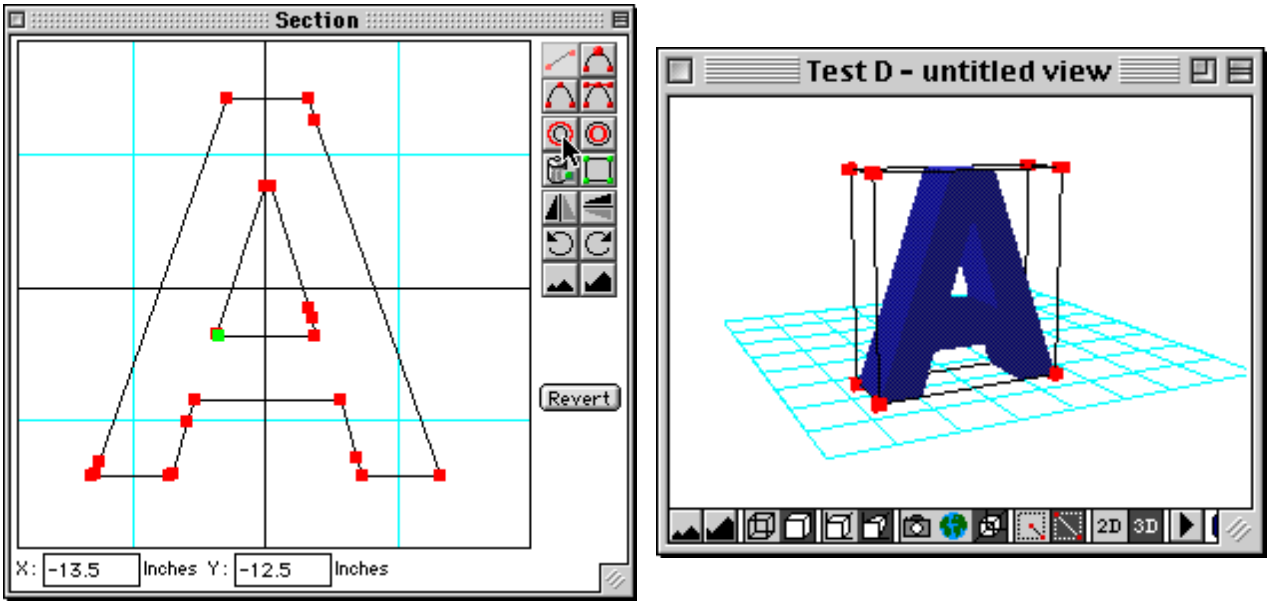
The way light shines on a surface will be affected by whether a contour is defined as being an internal or an external contour. A contour is part of a section made up of a closed line.

For example, the cross section of the letter A contains two contours. By default they are an external contour and an internal contour. As the window cut out of the letter A is defined as an internal contour, the light is shown shining down on the bridge of the letter A and the other inside surfaces are in shadow.



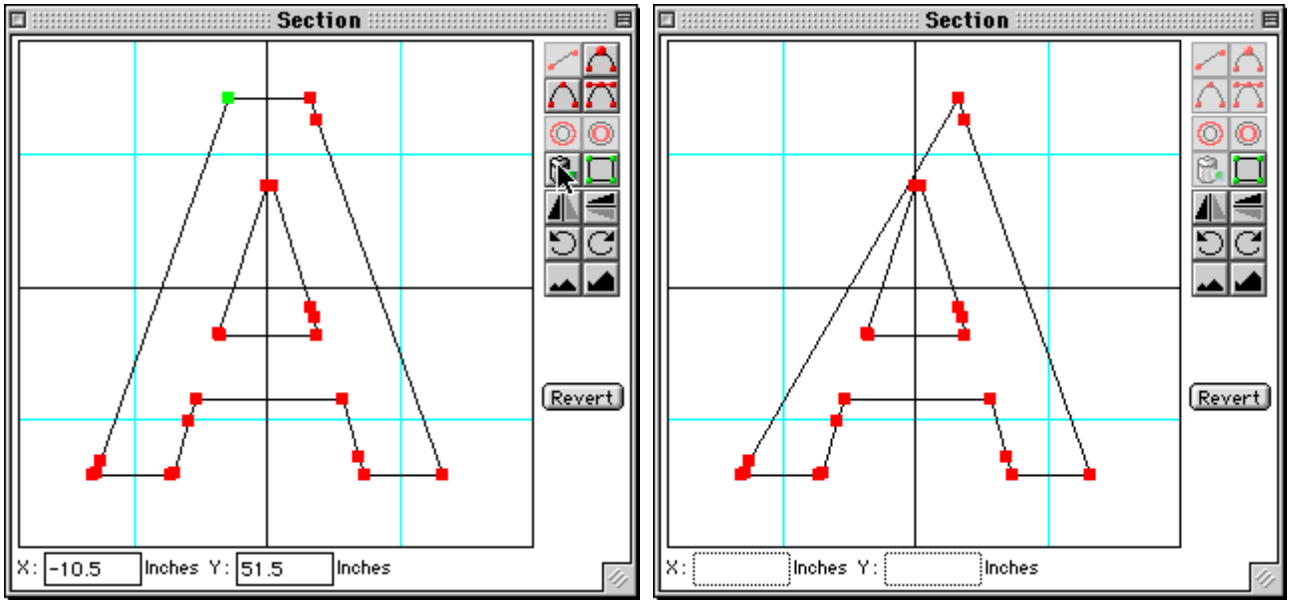

To change the definition of a contour, select a point on the contour line and click on the External Contour or Internal Contour button in the Section palette.

In the figure below, the internal contour of the letter A is selected and changed to an external contour. It is now treated as an external contour as far as the lighting effects are concerned, so the bridge of the letter A is now in shadow and the other inside surfaces have light shining on them.



### Delete

Select a point or points in the Section palette and click on the Delete button to remove them from the section.




### Select All

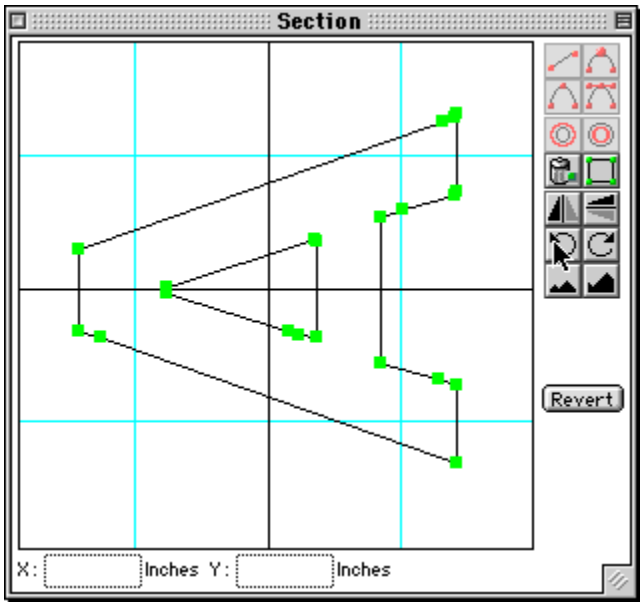
To select all the points in the section, click on the Select All button in the Section palette.

### Flip Vertical/ Flip Horizontal

The orientation of the object's section when it initially appears in the Section palette is determined by the way the original object was drawn and how the object's internal data structure is held by 3D World. To view the section in the same orientation as the object as it now is displayed in the 3D World document, it may be necessary to use the Flip Vertical or Flip Horizontal button to flip the section around the x or y axis. This affects only the view of the section in the Section palette, it does not affect the 3D geometry in the 3D World document window.

### Rotate Anticlockwise/ Rotate Clockwise

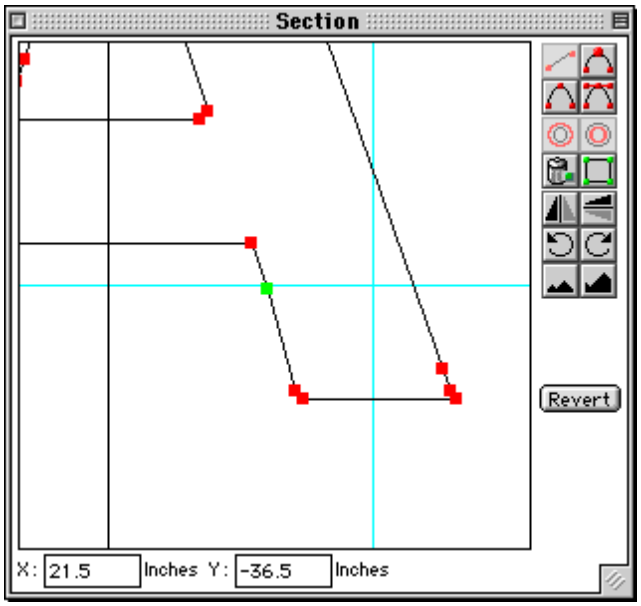
The orientation of the object's section when it initially appears in the Section palette is determined by the way the original object was drawn and how the object's internal data structure is held by 3D World. To view the section in the same orientation as the object as it now is displayed in the 3D World document, it may be necessary to rotate the section in the Section palette by clicking on the Rotate Anticlockwise or the Rotate Clockwise button. The section will be rotated by 90° in the relevant direction.




This affects only the view of the section in the Section palette, it does not affect the 3D geometry in the 3D World document window.

### Zoom In/ Zoom Out

Click on the Zoom In or Zoom Out button to zoom in or out of your view of the section in the Section palette. The view is centered on any selected points or on the center of the section if no points are selected.

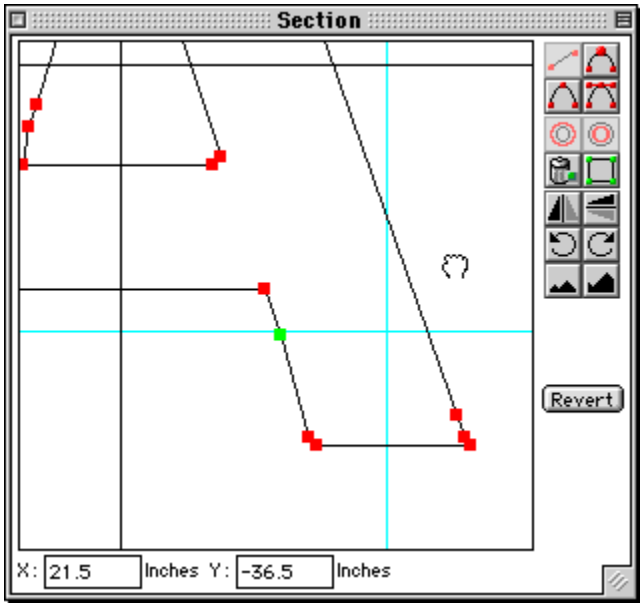



### Revert

Click on the Revert button to return to the section as it was when the object was first selected. This relates to the points on the section only, not to any view options you have used in the Section palette.

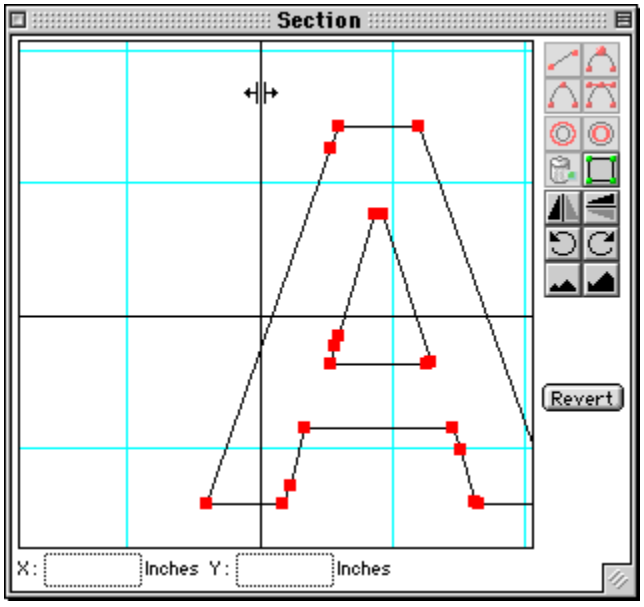
### Moving the Section Window Contents

Click on the section window and drag to reposition window contents. The section window will autoscroll.




### Changing the Object's Origin

Click on X or Y axis and drag to reposition the location of the axis relative to the section.



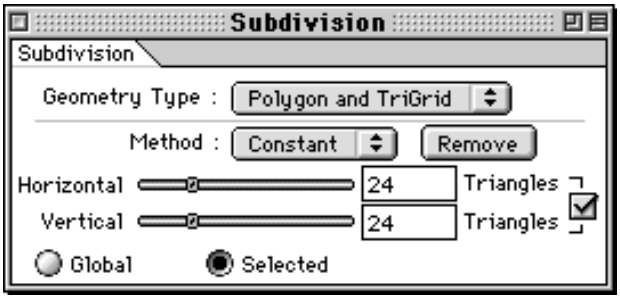
When the X or Y axis is moved the origin will change, so the origin of the object's path is changed relative to the object's section. This will alter the effects of using the Edit Path tool to scale and rotate the section of a geometry at specific points on its path. *See Edit Path on page I-34 for further details.*

## ◆ Subdivision

The Subdivision palette is used to specify what sort of internal geometries 3D World will use to draw conics and to determine how 3D World triangulates geometries drawn using conics or NURBs.

**Note:** The conic geometries are: cone, cube, cylinder, sphere and torus. If the NURBs geometry type is chosen, the way that geometries are drawn using the Mountain or Mountains plug-ins will also be affected.

Select Subdivision from the Palettes menu to display the Subdivision palette:




### Geometry Type

The Geometry Type setting is a modal setting to determine the sort of internal geometries 3D World will use to draw conics. Existing geometries are not changed when this setting is altered.

- **Polygon and Trigrid:** This is the method of drawing conics used prior to QuickDraw 3D version 1.5.
- **Conic Primitives:** The relevant geometries will be drawn using QuickDraw 3D 1.5 conics. Conic Primitives use very little memory compared to Polygon and Trigrid geometries, but will take longer to render.

- **NURBs:** The relevant geometries will be drawn using NURBs. NURBs use very little memory compared to Polygon and Trigrid geometries and can produce smooth surfaces. NURBs are also more editable, but will take longer to render.

#### Method

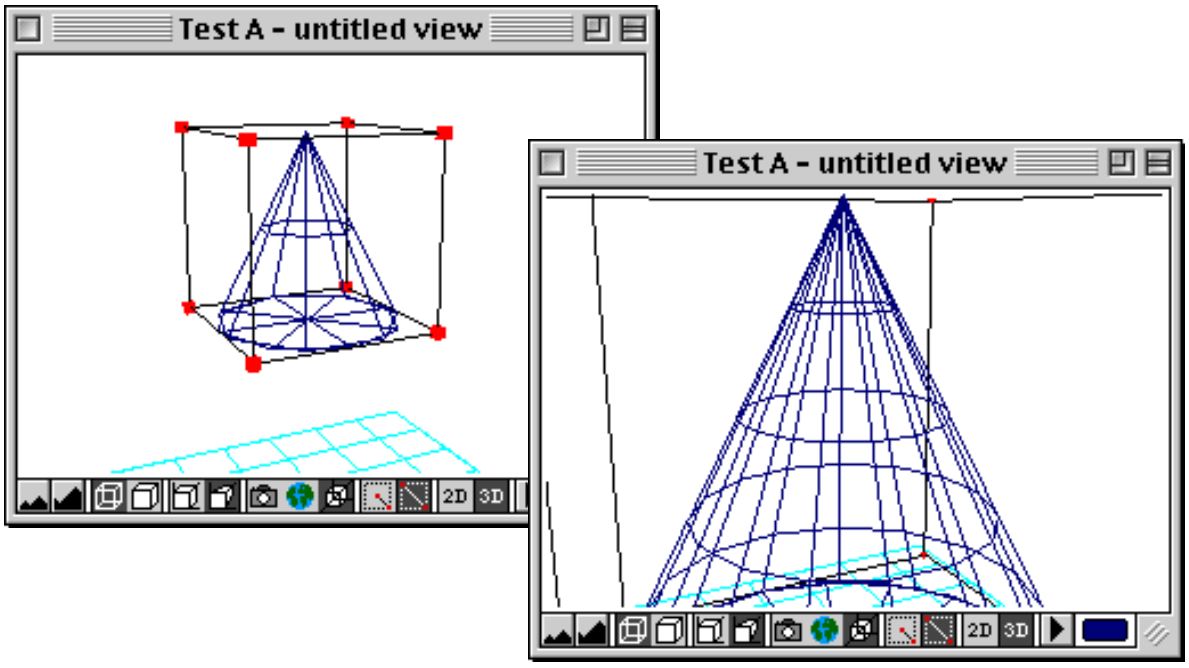
The Method settings have no effect on geometries drawn using Polygons and Trigrids, but specify how QuickDraw 3D should triangulate geometries drawn using Conic Primitives and NURBs.

- **Global:** If nothing is selected in the document, the Global radio button will be on, and the global settings will be changed.
- **Selected:** If an object is selected in the document, the Selected radio button will be on, and just the settings for the selected object(s) will be changed. Alternatively, switch on Global to change the global settings.

Select the Method setting, then adjust the Horizontal and Vertical slider bars or enter values in the Horizontal and Vertical fields. Check or uncheck the constrainer box on the right of the dialog as required.

- **Constant:** Specify the number of triangles an object is to be subdivided into.
- **Screen:** Specify the maximum number of pixels that one side of a triangle can be.
- **World:** Specify the maximum size, in inches or millimeters, that one side of a triangle can be.

If either the Screen or World method is chosen, the number of triangles making up an object will vary depending on the view of the object. An object seen close up, will be made up of more triangles. This is known as dynamic tessellation.




These options enable the user to work with objects made up of relatively few triangles, which will be fast to render, then change the settings so that objects are made up of more triangles (depending on the view) to produce a final render or high quality print.

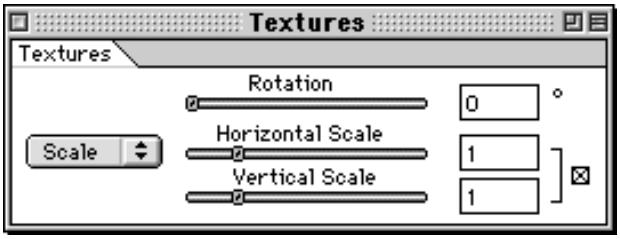
#### Remove

If a Method setting other than the Global setting has been applied to an object, this can be removed by selecting the object and clicking on the remove button. The geometry will then be triangulated according to the Global settings.

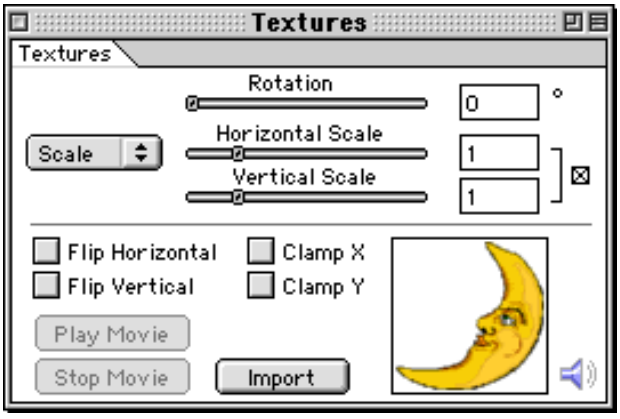
## ◆ Textures

Use the Textures Palette to manipulate a texture applied to an object.

Select Textures from the Palettes menu to display the Textures palette:

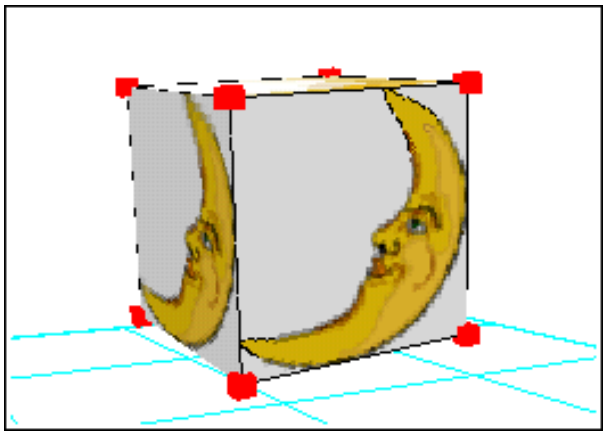



Click on the shrink/expand button in the top right corner of the palette to extend it:




The contents of the palette will be grayed out unless an object with a texture applied to it is selected.

When a texture is applied to an object it is scaled/stretched to fit once on each surface. The texture can then be manipulated using the controls in the Textures palette.



### Texture Palette Options

- **Rotation**: Enter a value between 0 and 359.9 in the rotation field and press the Return, Enter or Tab key or use the rotation slider to adjust the degree of rotation of the texture applied to the object.
- **Offset:** Select Offset from the pop-up menu and the two slider bars to the right of the pop-up menu will relate to horizontal and vertical offset. The values for horizontal and vertical offset can be linked by clicking on the constrain box to the right of the slider bars.

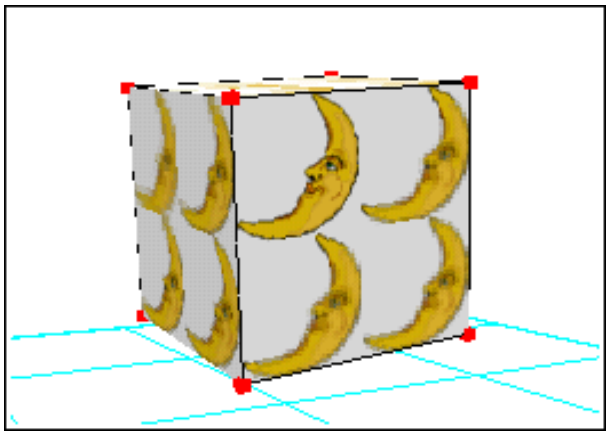
  **Horizontal Offset:** Enter a value between 0 and 1 in the Horizontal Offset field and press the Return, Enter or Tab key or use the slider bar to move the texture across the object in a horizontal direction.

  **Vertical Offset:** Enter a value between 0 and 1 in the Vertical Offset field and press the Return, Enter or Tab key or use the slider bar to move the texture across the object in a vertical direction.

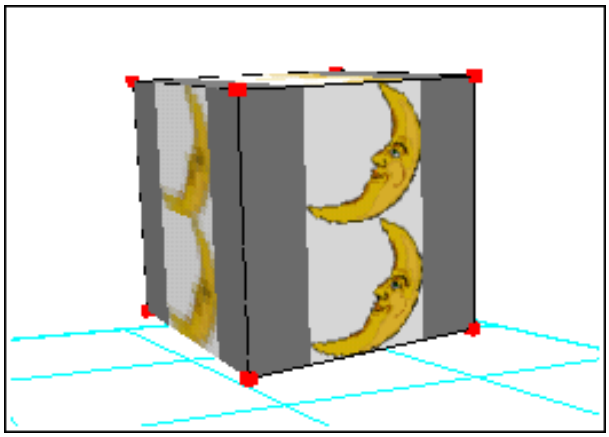
- **Scale:** Select Scale from the pop-up menu and the two slider bars to the right of the pop-up menu relate to horizontal and vertical scale. The values for horizontal and vertical scale can be linked by clicking on the constrain box at the right of the slider bars.

  **Horizontal Scale:** Enter a value between 0 and 25 in the Horizontal Scale field and press the Return, Enter or Tab key, or use the slider bar to change the horizontal scale of the texture on the object.

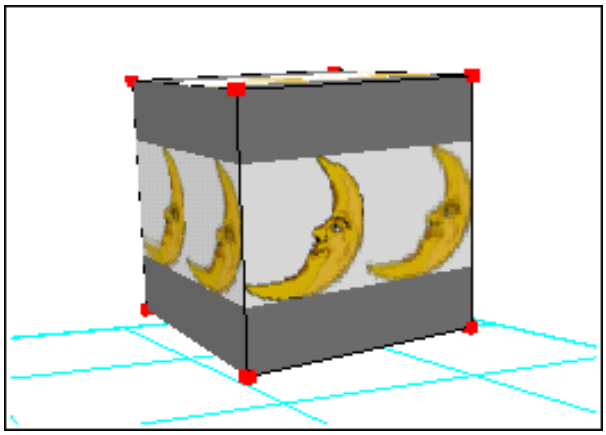
**Vertical Scale:** Enter a value between 0 and 25 in the Vertical Scale field and press the Return, Enter or Tab key or use the slider bar to change the vertical scale of the texture on the object.



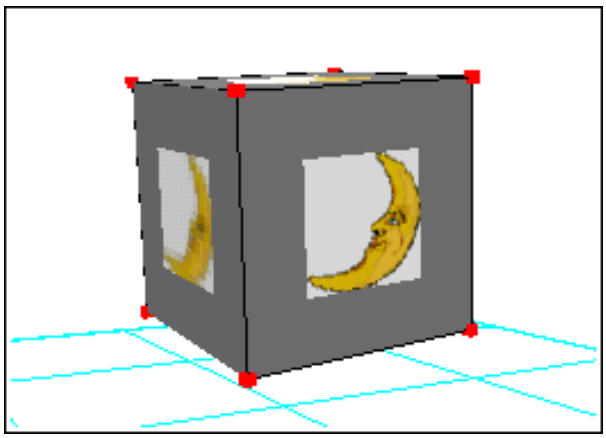
- **Flip Horizontal:** Check the Flip Horizontal check box to flip the texture applied to the object around the horizontal axis.
- **Flip Vertical:** Check the Flip Vertical check box to flip the texture applied to the object around the vertical axis.
- **Clamp X:** Check the Clamp X check box to prevent the texture being repeated in the X-axis. The texture offset can then be adjusted to position the strip of texture on the surface.



- **Clamp Y:** Check the Clamp Y check box to prevent the texture being repeated in the Y-axis. The texture offset can then be adjusted to position the strip of texture on the surface.



- If the texture is clamped in both the X and Y axes it is not repeated in either direction. The texture can then be scaled and positioned on the surface as desired.



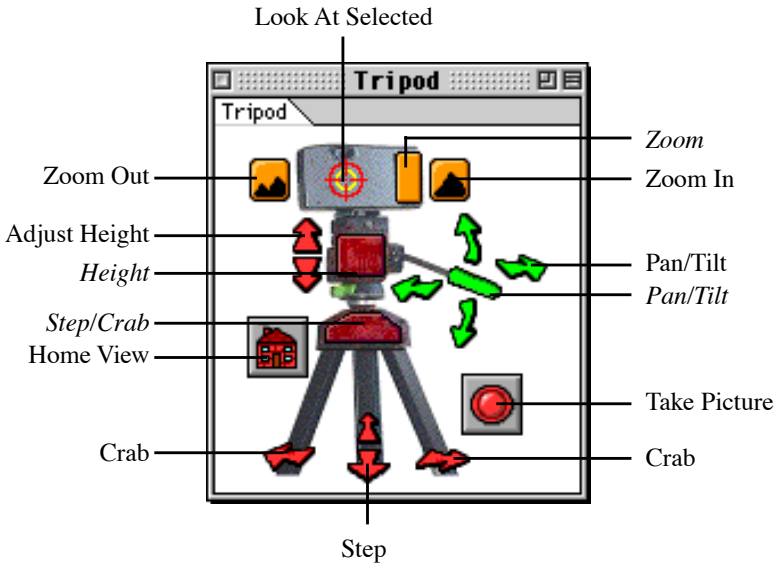
- **Play Movie:** This option is only available if a movie has been applied to an object as a texture. Click on the Play Movie button to start the movie playing. Note: the movie will only play if animation is turned on and is not paused. If animation has been turned off or paused via the Animation Player palette *(see Animation Player on page X-12)* or turned off via the Options menu *(see Animation On on page 3-41)*, the movie will not play until animation is turned on again.
- **Stop Movie:** This option is only available if a movie has been applied to an object as a texture. Click on the Stop Movie button to stop the movie playing.

- **Import:** Click on the Import button to display a standard dialog that allows you to select a PICT, TIFF, JPEG, GIF, PICT clipping or movie file to import as a texture. To import a movie as a texture QuickTime version 2.0 or later must be installed. TIFF, JPEG, GIF and Movie Files can be dragged and dropped directly onto objects in the document, as long as the Textures palette plug-in is loaded.
- **Sound:** Use the Sound control to change the volume of the sound of any movie applied as a texture on a selected object. Click on the sound icon and a pop-up menu displays. Select the level of sound required.

## ◆ Tripod

The Tripod palette provides an alternate method to the controls in the Camera palette for a way of changing the view in the current document window. Most of the controls perform the same functions as those in the Camera palette, but may be easier to use.

Select Tripod from the Palettes menu to displays the palette:




The Tripod palette displays a graphic of a camera on a tripod. A variety of buttons provide controls for manipulating the camera, the above dialog shows how those controls are used. In most

cases click on the button to perform the relevant action. When using those buttons marked with italic text, click on the button and drag to perform the desired action.

#### Look At Selected

Select an object in the document and click on the Look At Selected button to position the camera to centre the selected object in its view.

#### Zoom

The Zoom controls are used to narrow or widen the focus of the camera lens

#### Height

The Height controls are used to change the height of the camera.

#### Pan/Tilt

The Pan/Tilt controls are used to change the camera's angle by turning it left and right or tilting it up and down.

#### Step/Crab

The Step/Crab controls are used to move the camera closer, further away, left, and right.

#### Home View

Click on the Home View button to return the camera to its initial position (the view displayed when a new file is opened).

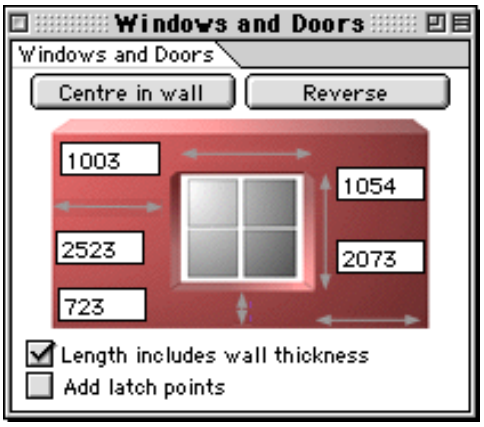
#### Take Picture

Click on the Take Picture button to save a PICT image of the window contents at 72dpi.

## ◆ Windows and Doors

The Windows and Doors palette is used to accurately position windows and doors in a wall. *See Windows and Doors on page G-68 for more details.*

Open the Windows and Doors palette by selecting its name from the Palettes menu, and select a window or door item in the document.




- **Centre in wall:** Click on this button to centre a window or door in the wall. Doors will be positioned in the centre of the length of wall but will remain on the grid, windows will be positioned centrally in both dimensions.
- **Reverse:** Click on this button to mirror a window or door about the vertical axis. Note that this does not actually rotate the item, just changes its appearance.
- **Measurements:** The dimensions of the window/door, the length of the wall on either side of the window/door and the height of the window/door above the grid displays in fields in the palette. Type in new values to change these measurements as required. When you click in a field to enter/revise values, a black arrow shows which dimension that value refers to.
- **Length includes wall thickness:** Check this check box if you wish the measurements displayed for the length of the wall on either side of the window/door to include the thickness of the wall. This will depend on whether you are working from internal or external measurements.
- **Add latch points:** Latch points are used to align and snap objects to. *See Latching Options on page D-39 for more details.* Latch points are automatically present at the corners and

mid points of an object's bounding box. Click on this checkbox to specify that additional latch points should be added at the points where the window/door intersects with the wall.

# *Appendix E*

# *Idler Plug-ins*

Idler plug-ins have no interface and run constantly in the background when loaded.

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Draw Direct Idler E-2

PhotoLink E-2

Status E-6

## ◆ Draw Direct Idler

The Draw Direct Idler plug-in automatically sets the application to draw direct to screen whenever a non-interactive renderer is selected, and switches the application back to draw into memory when an interactive renderer is used.

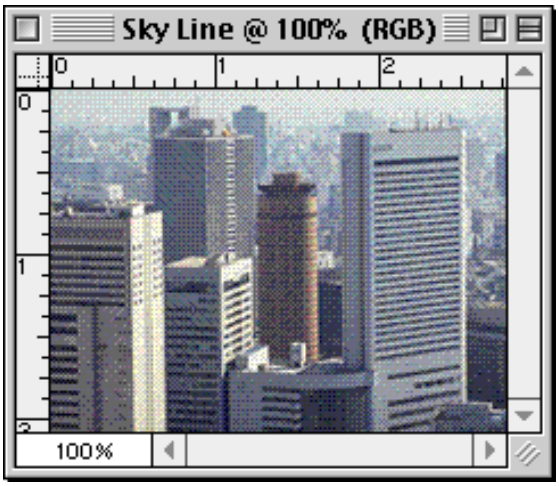
When a non-interactive renderer is selected and a large file is drawn to screen via memory, it may take a while for the scene to appear as it will display as a complete scene only once it has been completely drawn in memory. Using the Drawing Direct Idler plug-in allows you to receive feedback as to what is happening during this time as the scene is drawn directly to screen. This means that you will be able to see it in the process of being drawn rather than having to wait to see the finished result.

The Draw Direct Idler works independently of the Draw Direct Command plug-in, and ideally only one or the other of these plug-ins should be loaded and used. If both plug-ins are loaded, the second one to be loaded will have priority. If both are in the plug-ins folder and launched with the application, the Draw Direct Idler will be loaded second and so have priority.

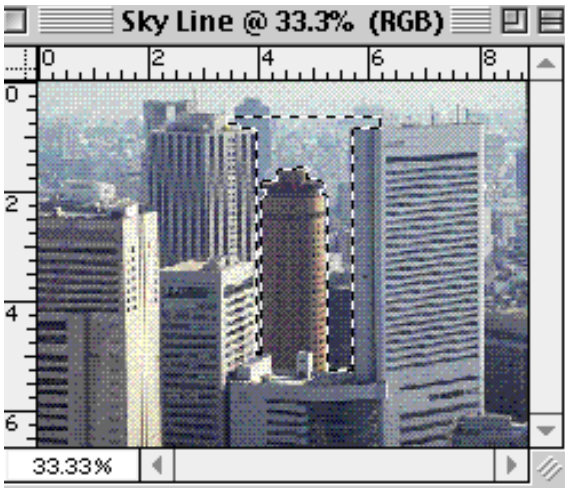
## ◆ PhotoLink

The PhotoLink plug-in is used to link 3D World to Adobe PhotoShop or any PhotoShop plug-in compliant application, such as Microspot's PhotoFix, and is useful for adding 3D models or 3D text into photographic images. The 3D World PhotoShop filter must be placed in the PhotoShop or PhotoFix plug-ins folder, and allows 3D World to be accessed directly from within the image editing application.

1. Launch the image editing application and open an image file:

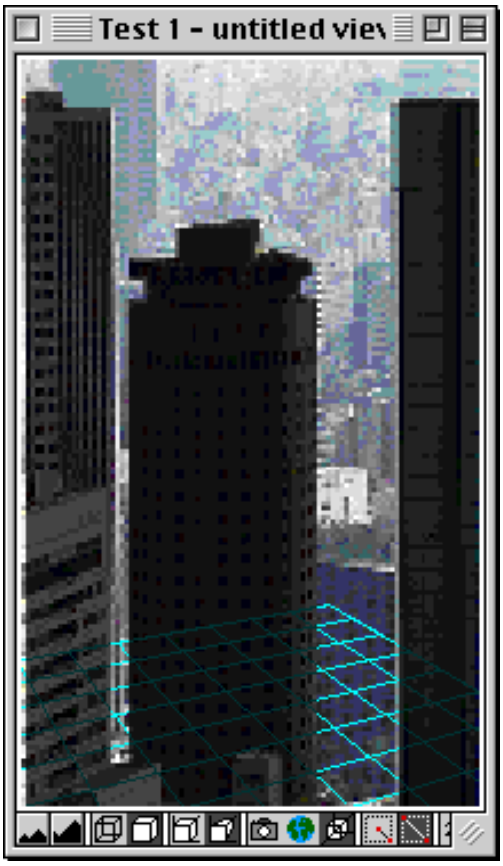



2. If necessary, make a selection of the area you wish to work in within 3D World:




3. Select 3D World from the 3D Render submenu in the Filter menu. An alert will display asking if you wish to open a new or existing 3D World document. A standard dialog will display for you to select the file to open or name and save a new file.

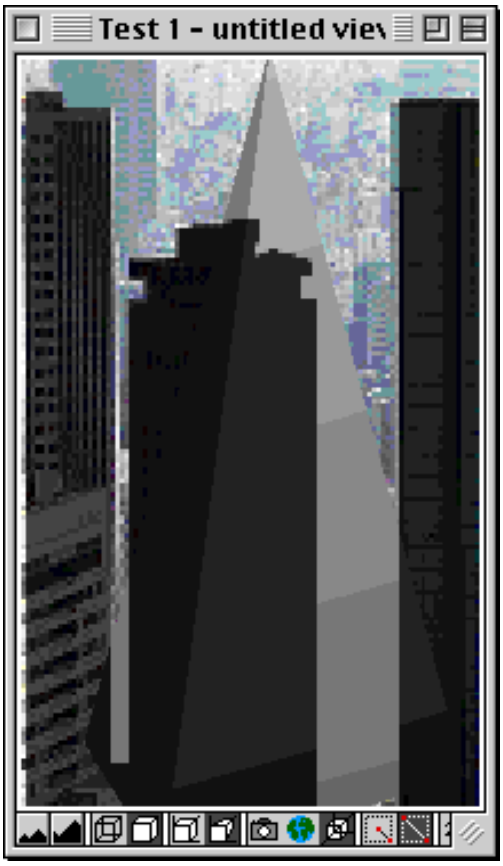
4. If 3D World is not already open, it will be launched. The area selected in the image editing application document is placed in the 3D World document as a background picture. Any masked areas, i.e. areas not in the selection, are placed in the foreground.




5. The PhotoLink palette for the image editing application will also be displayed. Use the Mask Transparency slider to adjust the transparency of the masked areas in the foreground, if necessary, to make it easier to draw or select 3D objects.

Adobe Photoshop® 4.0.
Press the Render Scene button to render the scene back when ready.
Mask Transparency
Render Scene
Cancel Filter

6. Draw your 3D object(s) and add any lighting effects as required:

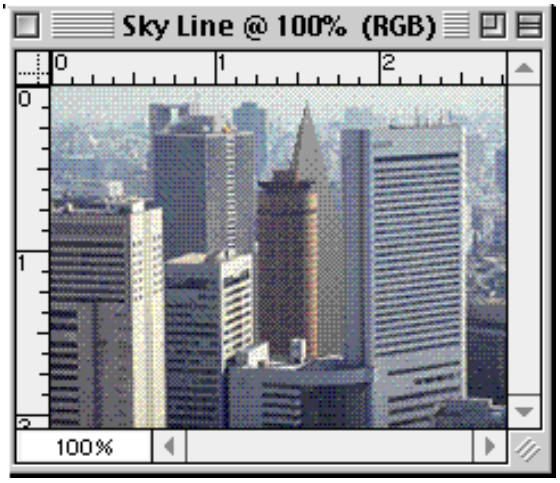



7. When you have finished drawing in 3D, click on the Render Scene button in the Photo-Link palette.

   3D World will automatically save the document before rendering, and if you then select 3D World again by choosing the Last Filter option in the image editing application's Filter menu, the last document is opened without any alerts.

   If 3D World was launched by the image editing application, it will quit, otherwise the document will be closed, but 3D World will be left running.

The rendered scene will be placed in the image editing application file.



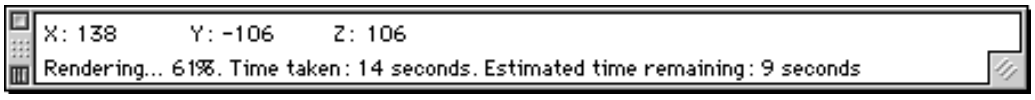

**Note:** Once 3D World has been selected from the 3D Render submenu in the Filter menu, you will not be able to work in the image editing application until you have switched back into it from 3D World by either clicking on the Render Scene or Cancel Filter button in the PhotoLink palette. To remind you of this, a 3D World dialog displays when the image editing application is the foreground application. Click on Cancel to cancel the filter action or Switch to 3D World to return to 3D World and continue drawing in 3D.

## ◆ Status

The Status plug-in calculates the status of the rendering process when a non-interactive renderer is used.

1. Choose a non-interactive renderer from the Renderer Options palette.

2. The percentage of the scene that the renderer has completed, the time the renderer has taken to draw so far, and the estimated time remaining is calculated.
3. The information is displayed in the Help palette (select Help from the Palette menu to display).



# *Appendix F*

# *Plug-in Tools*

Individual plug-in tools are discussed in *Appendix G — Plug-in Geometries* and *Appendix H — Plug-in Modifiers*. This appendix provides information relevant to both types of plug-in tool.

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Tool Options F-3

## INTRODUCTION

Plug-in tools are either plug-in geometries or plug-in modifiers. *See Appendix G — Plug-in Geometries on page G-1 and Appendix H — Plug-in Modifiers on page H-1 for details of individual plug-ins*. When loaded, plug-in tools appear in the Tools palette and can be positioned in the palette by the user as discussed below.

### ◆ Configuring The Tools Palette

When 3D World is launched with all the plug-ins loaded, plug-ins are sorted into logical groups, the contents of each group being stacked together and appearing under a single button in the Tools palette. Any unclassified plug-in will be placed under a general Plug-in Geometries or Plug-in Modifiers button at the bottom of the Tools palette.

The Tools palette is configurable, so you can move tools around to position them in the location or group that is most convenient or logical for you.

Configure the Tools palette in the following way:

- Click on a tool and hold down the mouse button to display a pop-up menu showing the other tools in the stack (if any). Select the name of a tool in the pop-up menu to select the tool and bring it to the top of the stack.
- To move a tool, hold down the Command key, click on the tool and drag it to a new location.
- Drop a tool onto another tool to stack them together.
- Drop a tool onto the four selection tools at the top of the palette to separate it from a group of stacked tools and add it to the top of the tool palette as an individual tool.

## ◆ Tool Options

To open a dialog showing any options available for a tool, use either of the following methods:

- Hold down the Option key and select the tool in the Tools Palette.
- Click on the tool in the Tools palette and hold down the mouse button. Select the same tool from the pop-up menu that displays.

**Note:** There are no options available for the Arrow, Rotate, Rectangular Marquee and Hand tools.

# *Appendix G*

# *Plug-in Geometries*

Plug-in Geometries are plug-in tools that are used to create objects. When installed they are located in the Tools palette.

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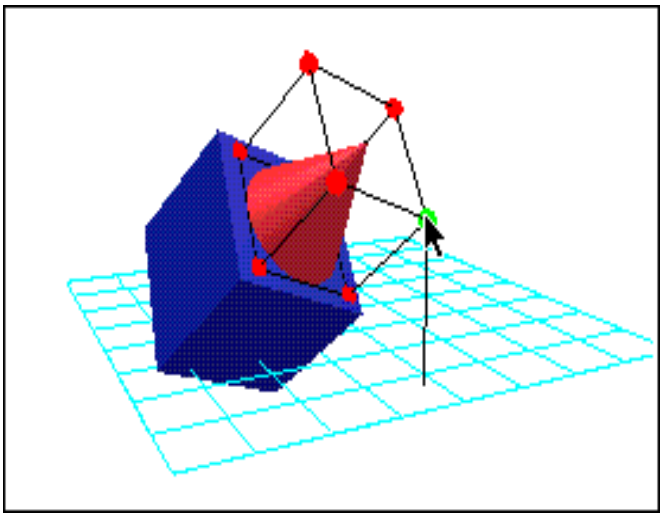
## Introduction

When loaded, Plug-in Geometries appear in the Tools palette. The position of each plug-in in the Tools palette will depend on how the user has configured the palette. *See Configuring The Tools Palette on page F-2 for more details*. The default arrangement is shown below.

Select the plug-in tool to use by clicking on its icon in the Tools palette.

### Drawing Objects

Objects are drawn perpendicular to the surface clicked on when you begin drawing. For example, if you click on the grid or an empty area, the object will be drawn upright. If you click on the surface of a rotated object, the new object will be drawn perpendicular to that surface:



### NURB Geometries

It is possible to draw Cone, Cube, Cylinder, Mountain, Mountains, Sphere and Torus geometries using NURBs. NURBs use very little memory compared to Polygon and Trigrid geometries and can produce smooth surfaces. NURBs are also more editable, but will take longer to render.

The Subdivision palette is used to specify what sort of internal geometries (polygons and trigrids, conic primitives or NURBs) 3D World will use to draw these geometries. *See Subdivision on page D-96 for more details.*

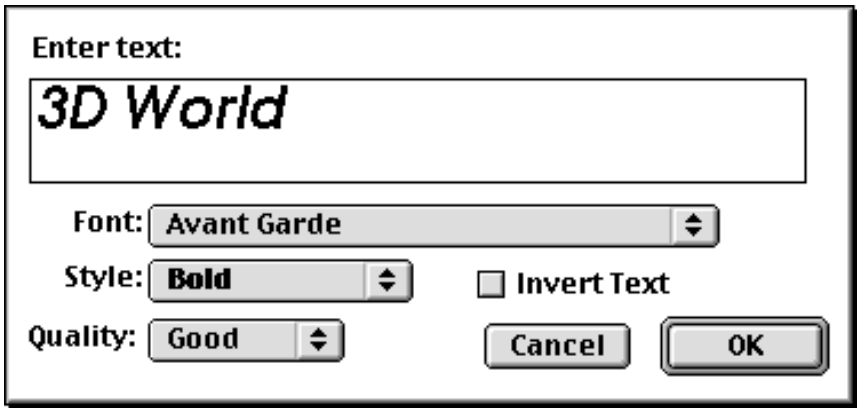
**Note:** NURBs — Non-Uniform Rational B-spline. This is the 3D equivalent of a Bezier curve.

## 3D Text

The 3D Text plug-in is used to create three dimensional text. Once created, the text can be manipulated like any other 3D object.

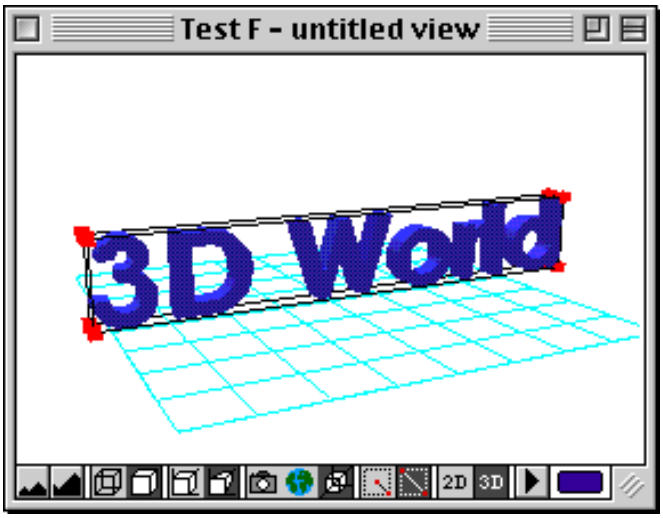
Select the 3D Text plug-in from the Tools palette and move the cursor over the document window. The cursor will change to a text insertion icon.

Click on the place you wish the text to appear. The Enter text dialog will display. Note: If you have a lot of fonts installed on your Mac, it may take a few seconds for this dialog to appear.

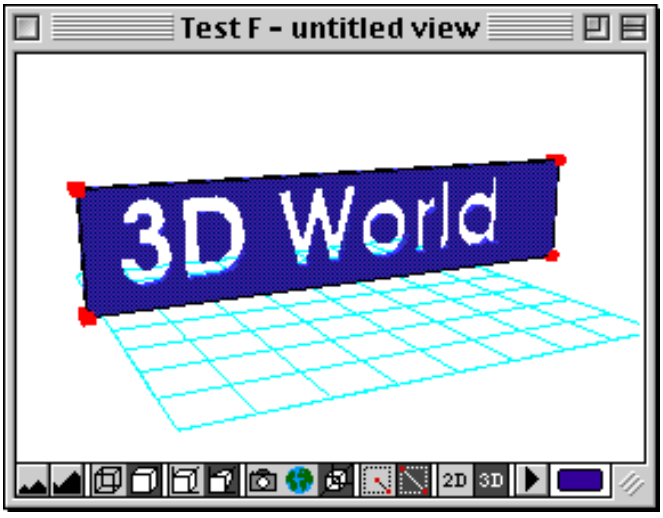



Enter the text in the top field and choose a font, style and text quality from the popup menus below. The higher the quality selected, the smoother the curves on the text will be drawn, but more memory will be required to display the text and it will be slower to display.

Leave the Invert Text check box unchecked to display your text as 3D letters. Click OK. The text will be placed in the document window:




Check the Invert Text check box and click OK. The text will be ‘punched out’ of a solid rectangle.

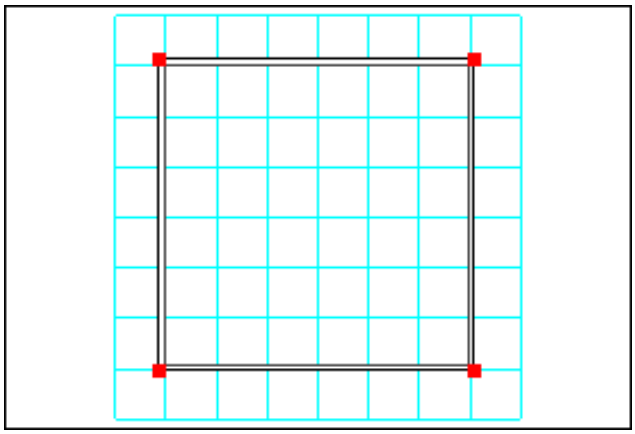



The text can be moved, resized and rotated, have colors, textures, images and sounds applied to it and the geometry path can be edited. You will not be able to ungroup a word to edit individual characters, although you can ungroup the front and back faces and extruded outlines. To do this you must flag the text as Dismantleable. *See Dismantleable on page 3-37 and Primitive/Dismantleable Flag on page 4-18 for further details.* If you need to manipulate individual characters, they must be entered separately.

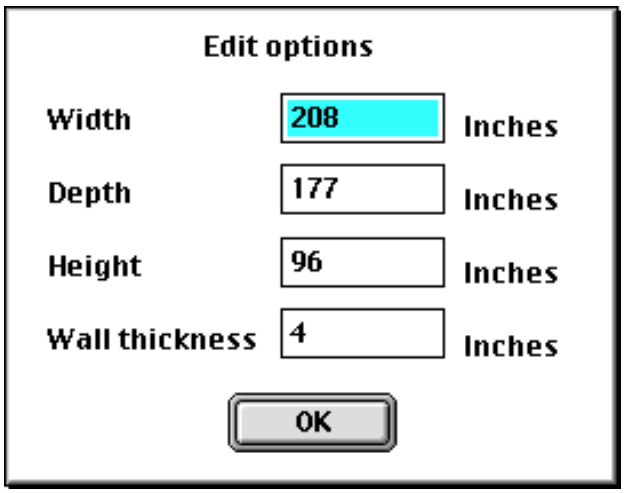
## 4 Walls

The 4 Walls plug-in is used to draw a regular, four-walled room. Walls are always drawn perpendicular to the grid and resting on the grid.

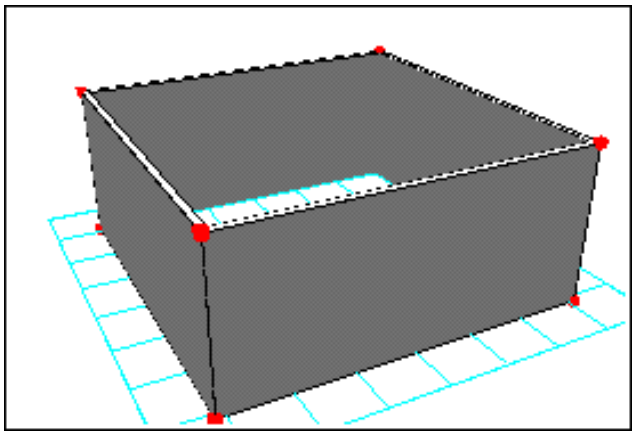
1. Select the 4 Walls plug-in from the Tools palette. The view will change to show an orthogonal, top view.
2. Click on the grid and, holding down the mouse button, drag to draw 4 walls:



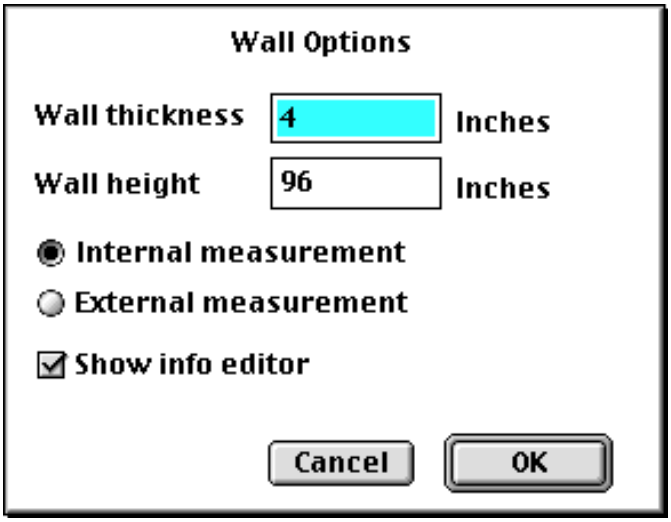
3. Release the mouse button and the Edit options dialog displays:



4. If necessary, enter values in the Width, Depth, Height and Wall thickness fields to specify the width and depth of the room, the height of the walls and the wall thickness.
5. Click OK. The view will change back to the previous view, and the walls will display at the dimensions specified. If the walls are the first items drawn, the room will be automatically centred on the grid.



To change the default settings for the 4 Walls plug-in, hold down the Option key and select the 4 Walls tool. The Wall Options dialog displays:




- **Wall thickness:** Enter a value to specify the default thickness for walls.
- **Wall height:** Enter a value to specify the default height for walls.

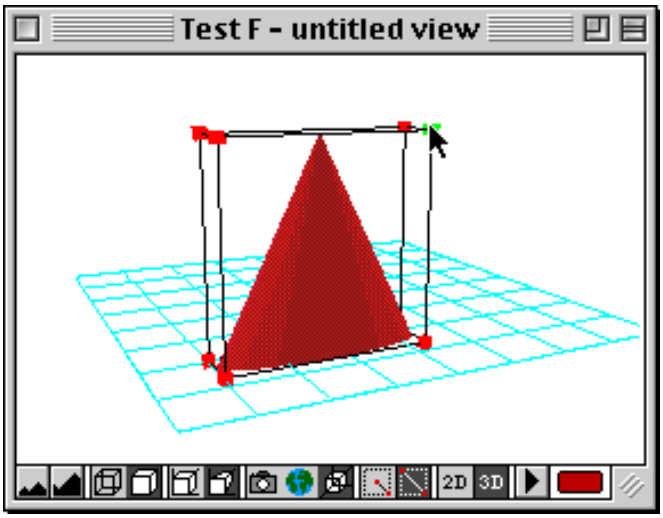
- **Internal measurement:** Click on the Internal measurement radio button to specify that values entered in the Entry options dialog (the dialog that displays after walls are drawn) relate to the measurements of the internal walls.
- **External measurement:** Click on the External measurement radio button to specify that values entered in the Entry options dialog (the dialog that displays after walls are drawn) relate to the measurements of the external walls.
- **Show info editor:** Check the Show info editor check box to specify that the Entry options dialog should appear after walls are drawn. Uncheck this check box if you do not want this dialog to display.

**Note:** The size, position and rotation of the walls are locked on entry. If you unlock the walls using the controls in the Info palette, the width and depth of the room, the height of the walls and the rotation of the room can be adjusted using the Info palette or the Arrow tool, but the wall thickness will be scaled proportionally. *See Info Palette on page 4-16 for more information.*

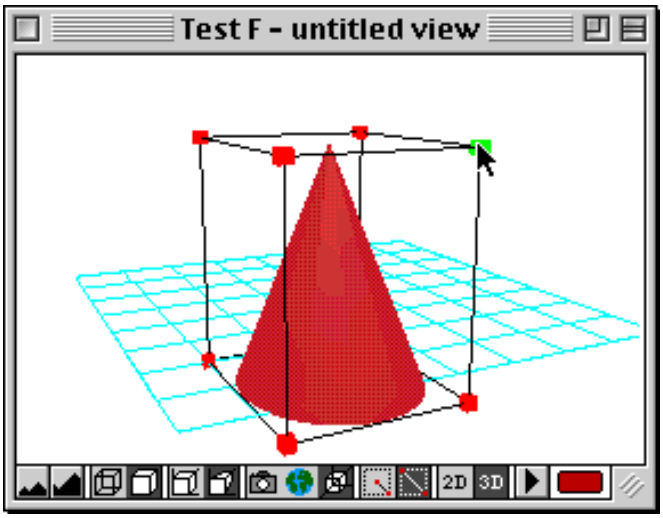
## Cone

The Cone plug-in is used to draw cone geometries.

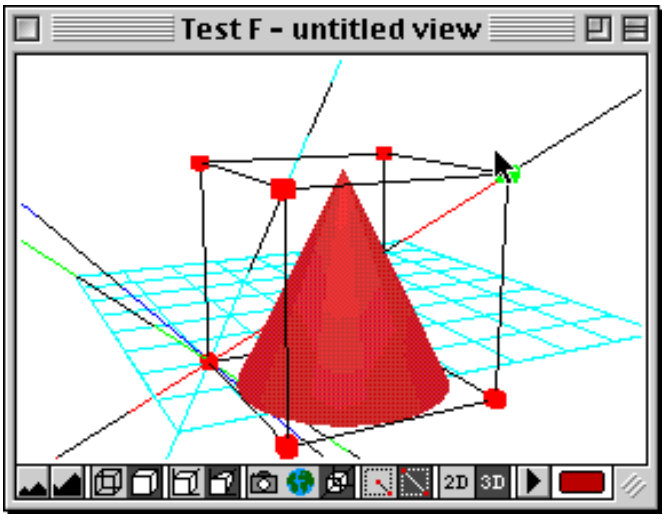
Place the cursor at the point you want to begin drawing, hold down the mouse button and drag to create a cone:




Hold down the Control key and move the mouse up or down to change the depth of the cone.



Holding down the Shift key to constrain the cross section of the cone to a circle, and the height of the cone to the diameter of the base:

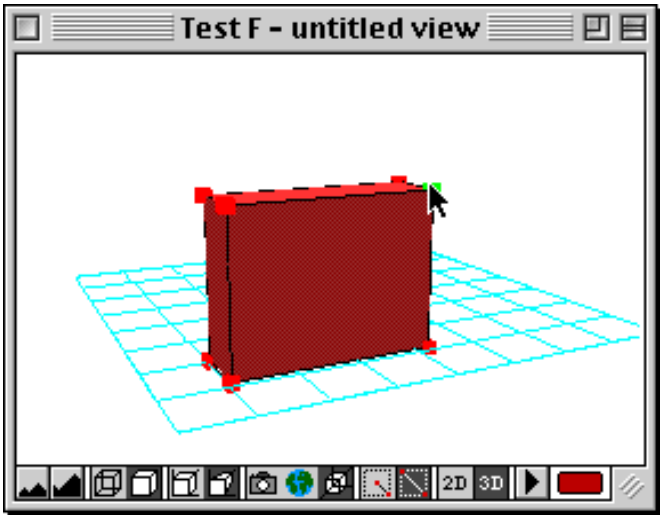



In 2D mode, you will not be able to create a 3D object and holding down the Shift key will constrain the object shape to a triangle with equal sides, or a circle, depending upon which plane you are drawing in. Using the Control key in 2D mode will not add depth to an object, but you can use it to draw your 2D shape in the Z dimension.

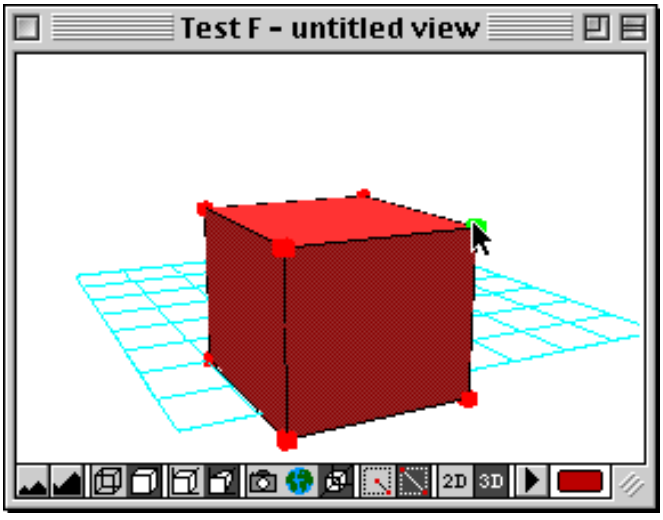
## Cube

The Cube plug-in is used to draw cube geometries.

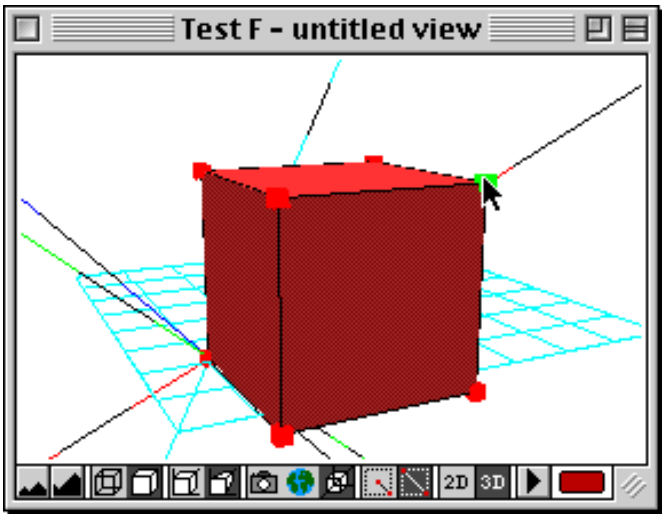
Select the Cube plug-in from the Tools palette. Position the cursor at the point you want to begin drawing and, holding down the mouse button, drag to create the cube geometry:




Hold down the Control key and move the cursor up or down to change the depth of the cube:



Hold down the Shift key while drawing to constrain the geometry to a cube:

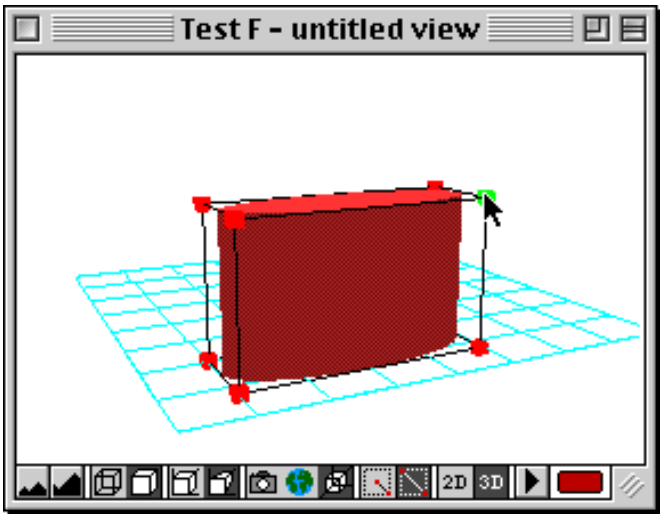



In 2D mode you will not be able to create a 3D object, and holding down the Shift key will constrain the object shape to a square. Using the Control key in 2D mode will not add depth to an object, but you can use it to draw your 2D shape in the Z dimension.

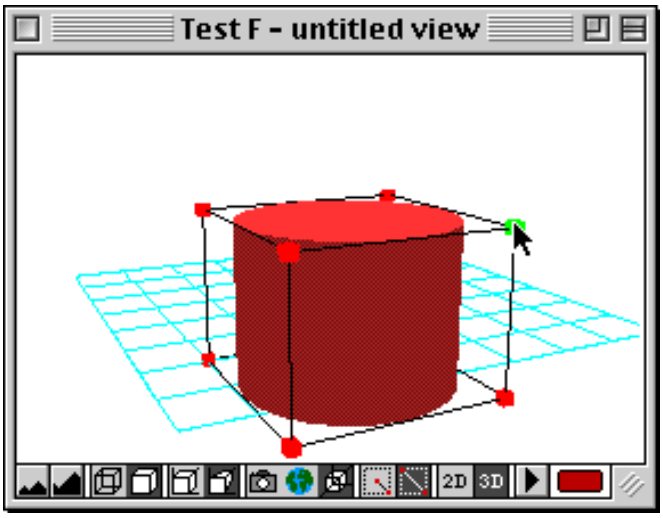
## Cylinder

The Cylinder plug-in is used to draw cylinder geometries.

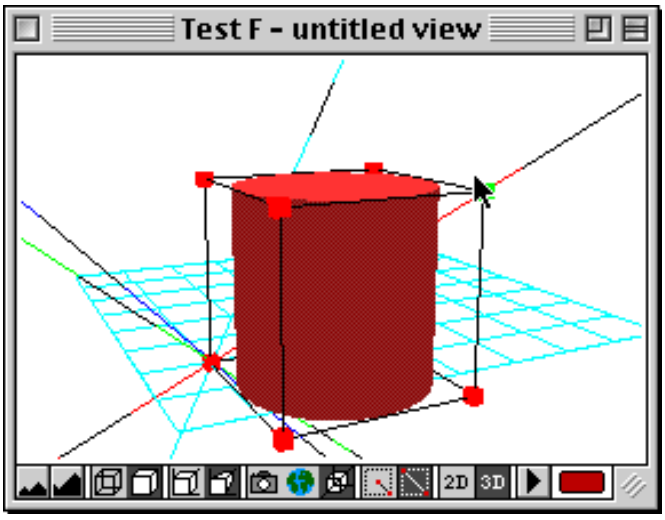
Select the Cylinder plug-in from the Tools palette. Place the cursor at the point you want to begin drawing and, holding down the mouse button, drag to create the cylinder geometry:




Hold down the Control key and move the mouse up or down to change the depth of the cylinder:



Hold down the Shift key while drawing the object to constrain the cross section of the cylinder to a circle, and the length of the cylinder to the diameter of the circle:



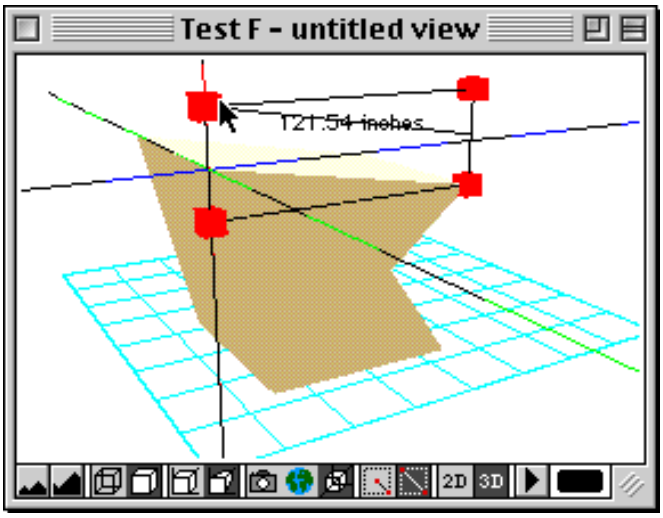

In 2D mode, you will not be able to create a 3D object, and holding down the Shift key will constrain the object shape to a square or circle depending on the plane you are drawing in. Using the Control key in 2D mode will not add depth to an object, but you can use it to draw your 2D shape in the Z dimension.

## ◆ Dimension

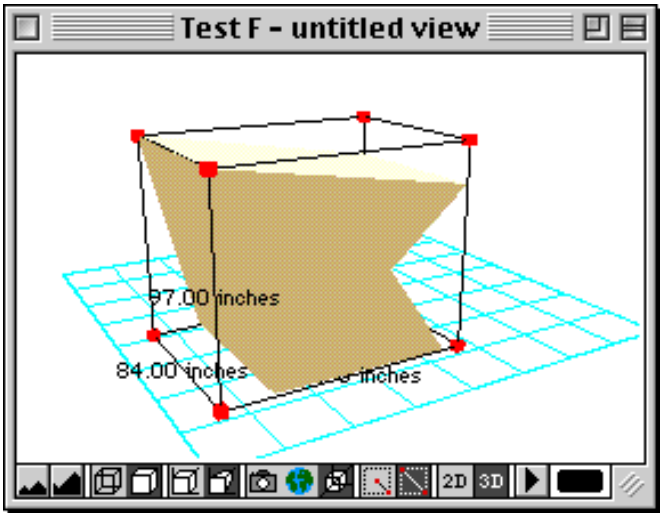
The Dimension plug-in is used to label objects with their dimension information.

1. Select the Dimension plug-in from the Tools palette.
2. Click on the point on an object to start measuring from. Holding down the mouse button, drag a dimension line out to the point on the object to measure to. When the cursor is over a vertex point it will change to a hollow cross. Let go of the mouse button to finish the dimension line.

3. To position the dimension line away from the object, click at the end of the dimension line and, holding down the mouse button, drag the dimension line away. A constraining line will display for each axis.




4. To automatically dimension the bounding box of an object, select the Dimension tool and click on the object.



## Furnishings

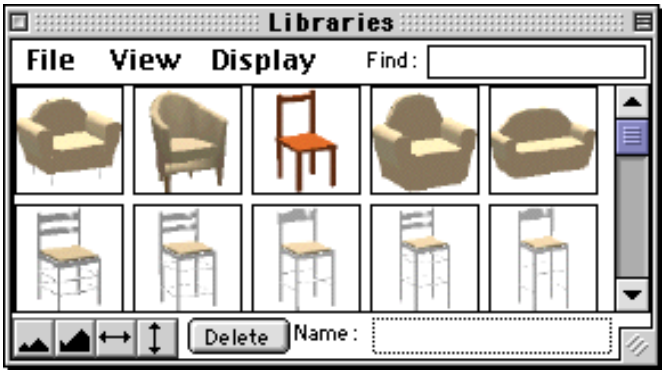
The Furnishings plug-in allows you to easily access furniture items to place in your document.

1. Click on the Furnishings plug-in icon in the Tools palette. The document window will change to display a top view and the Furnishings dialog will display:

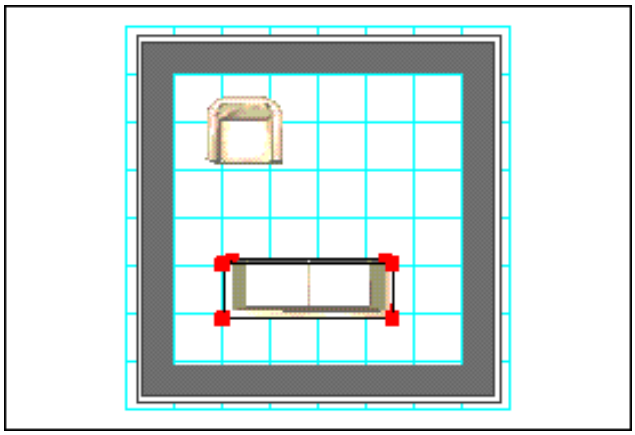
   The Nudge palette will also be opened (if it is loaded) to aid in the positioning of items. *See Nudge on page D-74 for more details.*

2. Click on one of the buttons in the dialog to access furnishings of that type.

   The Libraries palette is opened and the appropriate furniture library displayed — as long as a library (or an alias) with the specified name is located in the plug-ins folder. *See Libraries on page D-63 for more details.*



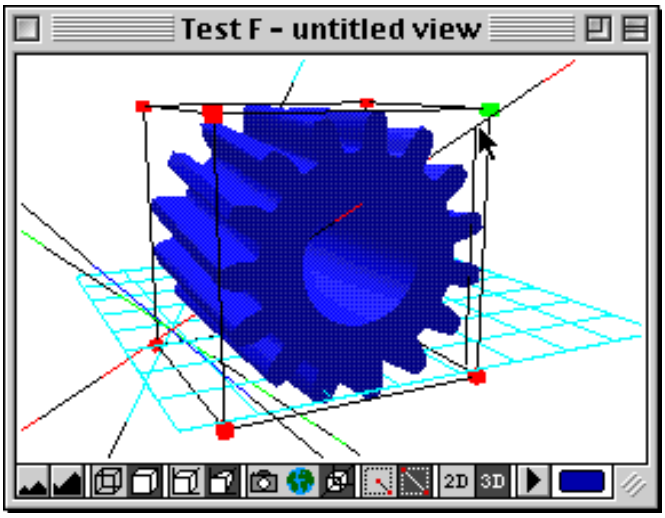
3. Furniture items can then be dragged out of the library and dropped into the room as required. The furniture items can be resized and positioned as necessary.



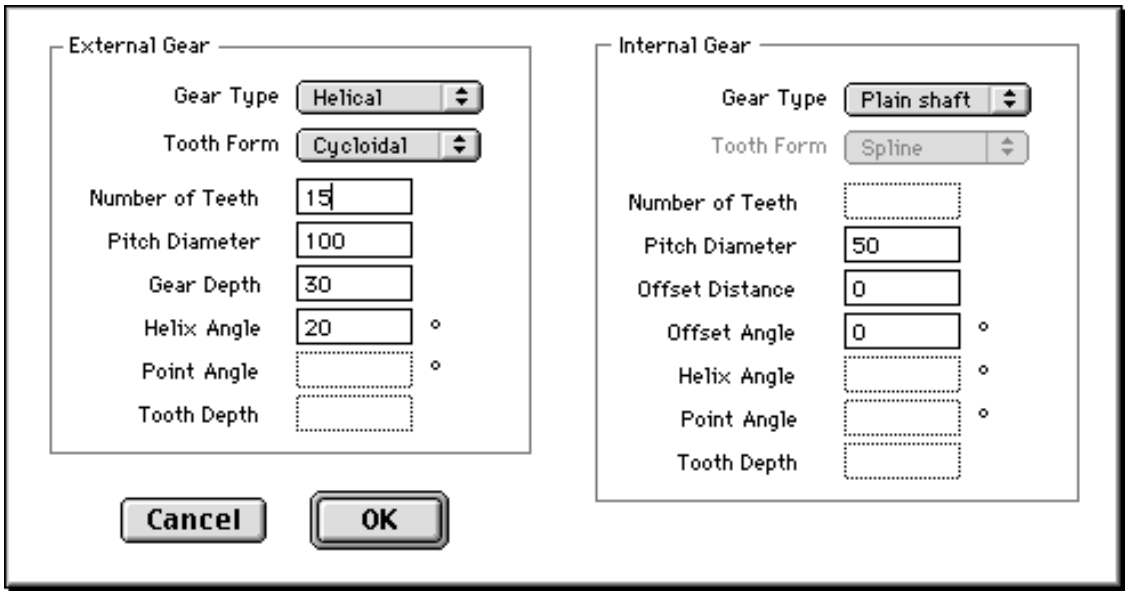
## Gears

The Gears plug-in is used to draw gears or cogs.

Select the Gears tool from the Tools palette. Click on the grid, hold down the mouse button, and drag to draw a gear geometry. The gear is automatically constrained to a shape of round cross-section and to the depth set in the Gear Options Dialog.



To change the Gear Options, hold down the Option key and click on the Gear tool again. The Gear Options Dialog displays:




### External Gear

Values in this area of the dialog relate to the outside face of the gear shape.

**Gear Type:** Select a type from the Gear Type popup menu to specify the type of gear to draw.

- Spur: A Spur type gear has teeth that run from the front of the gear to the back, perpendicular to the plane defined by the front face of the gear.
- Helical: A Helical type gear has teeth that run from the front of the gear to the back, at an angle of up to 87° to the plane perpendicular to the front face of the gear.
- Plain shaft: A gear with a plain shaft has no teeth.

**Tooth Form:** Select an option from the Tooth Form popup menu to specify the type of teeth the gear should have. This menu will not be available if Plain shaft has been selected as the Gear Type.

- Cycloidal: This is a standard shape of gear tooth. The surfaces of the tooth are more curved than those of a tooth with an involute shape.
- Involute: This is a standard shape of gear tooth. The surfaces of the tooth are flatter than those of a tooth with a cycloidal shape

- Spline: Choose this option if you wish to draw a gear with square shaped teeth.
- Triangular: This option is not yet available and will be grayed out.

**Number of Teeth:** Enter a value between 10 and 300 to specify the number of teeth on the gear. This option is not available if Plain shaft has been selected as the Gear Type.

**Pitch Diameter:** Enter a value between 0 and 10000 in this field to specify the Pitch Diameter. This is defined as the distance from center to center of mating gears, and determines the width of a gear.

**Gear Depth:** Enter a value between 1 and 10000 to determine the depth of the gear. This is its measurement in the Z dimension.

**Helix Angle:** This option will only be available if Helical has been selected as the Gear Type. Enter a value between 0° and 87° to specify the angle of the line, defined by a gear tooth, to the plane perpendicular to the front face of the gear.

**Point Angle:** This option is not yet available and will be grayed out.

**Tooth Depth:** The Tooth Depth option will only be available if the Spline option has been selected in the Tooth Form popup menu. Enter a value less than the Pitch Diameter to determine the depth of gear's teeth.

### Internal Gear

Values in this area relate to the internal face of the gear shape, the hole in the gear.

**Gear Type:** Select an option from the Gear Type popup menu to specify the type of internal gear to draw.

- Spur: A Spur type gear has teeth that run from the front of the gear to the back, perpendicular to the plane defined by the front face of the gear.
- Helical: A Helical type gear has teeth that run from the front of the gear to the back, at an angle of up to 87° to the plane perpendicular to the front face of the gear.
- Plain shaft: If you wish the gear to have a straight hole through it, select Plain shaft from the popup menu.
- None: If the gear is to be solid, with no hole in it, select None.

**Tooth Form:** The only option currently available in this menu is Spline. It will not be available if Plain shaft or None has been selected as the Gear Type.

- Spline: This option produces an internal gear with square shaped teeth.

**Number of Teeth:** Enter a value between 10 and 300 to specify the number of teeth on the internal gear. This option is not available if Plain shaft or None has been selected as the Gear Type.

**Pitch Diameter:** Enter a value in this field to specify the Pitch Diameter. This is defined as the distance from center to center of mating gears, and determines the width of the internal gear. The minimum value is 0, the maximum value is limited by the Pitch Diameter of the external gear. This option is not available if the Gear Type selected is None.

**Offset Distance:** The value entered in this field determines the distance the internal gear is offset from the center point of the external gear. The minimum value is 0 and the maximum value limited by the Pitch Diameter of the external gear. This option is not available if the Gear Type selected is None.

**Offset Angle:** Enter a value between -360 and 360 to position the internal gear the stated number of degrees around the face of the external gear, 0° being the 3 o'clock position looking at the front of the gear. This option is not available if the Gear Type selected is None.

**Helix Angle:** This option will only be available if Helical has been selected as the Internal Gear Type. Enter a value between 0° and 87° to specify the angle of the line, defined by an internal gear tooth, to the plane perpendicular to the front face of the gear.

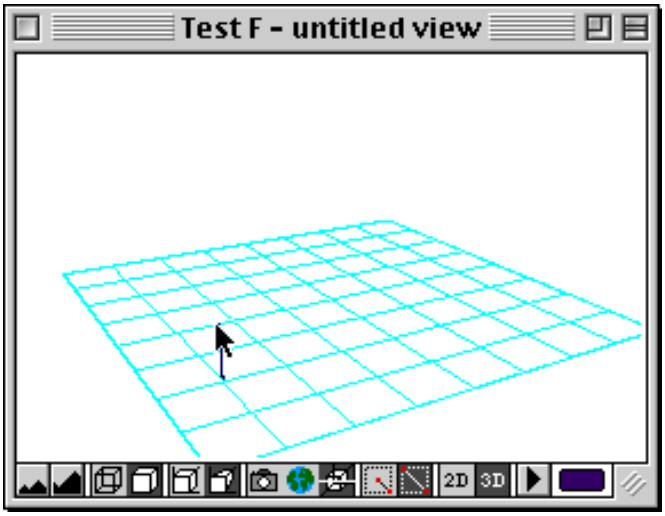
**Point Angle:** This option is not yet available and will be grayed out.

**Tooth Depth:** The Tooth Depth option will only be available if the Spline option has been selected. Enter a value less than the Internal Gear Pitch Diameter to determine the depth of the teeth of the gear.

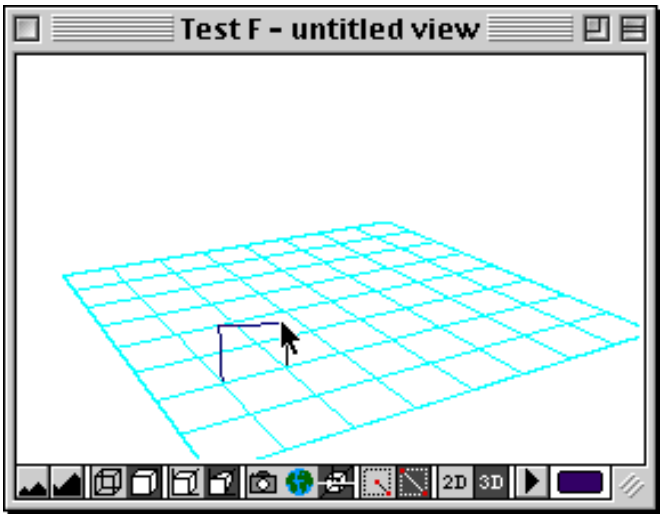
## Irregular Polygon

The Irregular Polygon plug-in is used to define a cross section, which is then extruded to create an irregular polygon geometry.

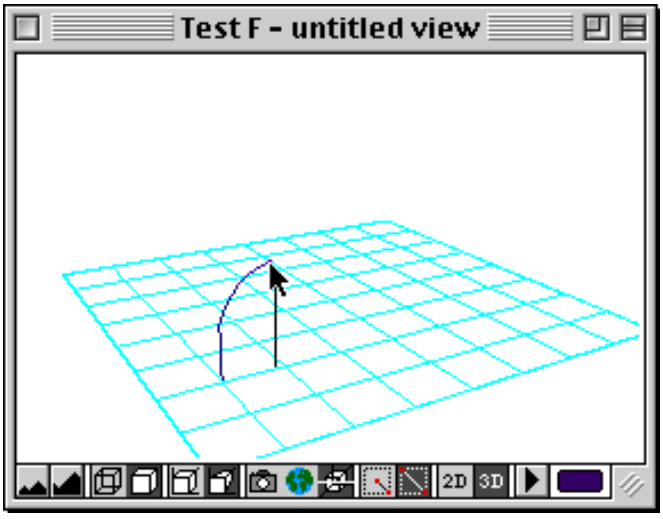
1. Position the cursor where you want to begin drawing, click the mouse button to place a vertex point, move the cursor and click again:



2. To draw an arc, hold down the Option key and click at the point that will represent the center of a circle.

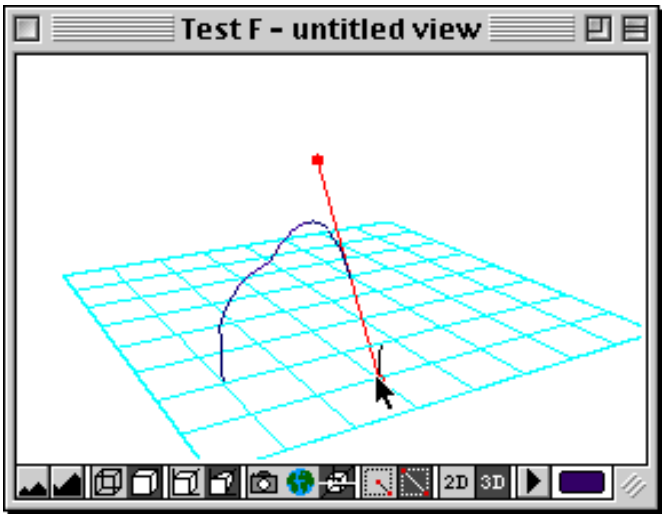



3. Release the Option key and mouse button and move the cursor ready to place the next point. The arc will display:

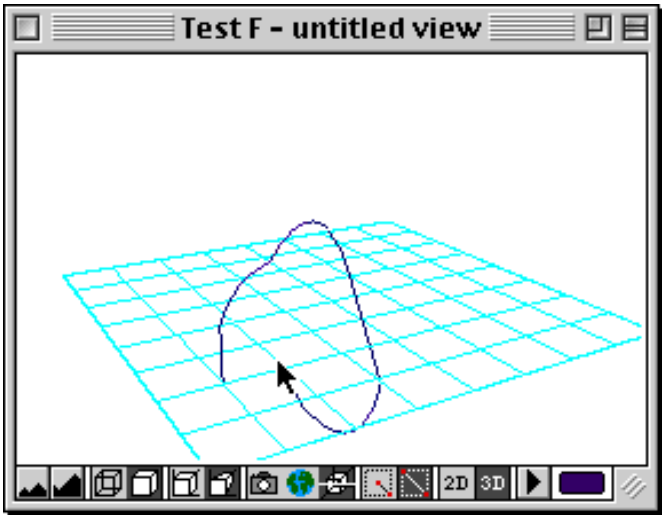



4. Click to place the next point at the end of the arc.

5. To draw a Bezier curve, click and drag the cursor.

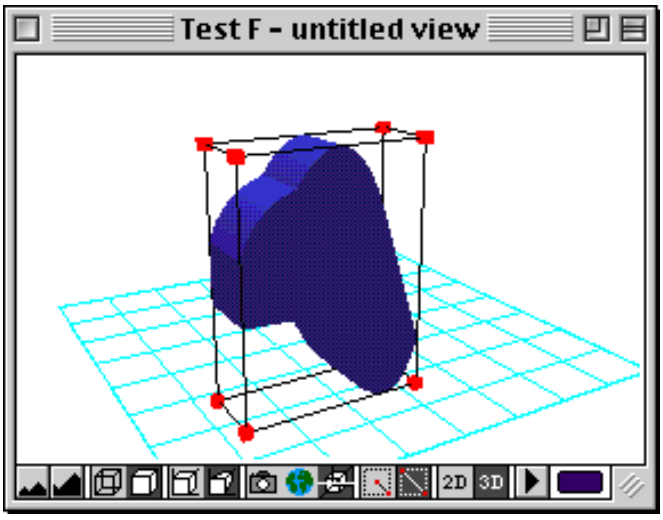



6. To draw a spline curve, hold down the Option key and click and drag the cursor.




7. Use the Delete key at any time to delete the last point placed.

8. Double-click at any time to complete the shape.




The following modifier keys can be used when drawing the irregular polygon cross section:

- **The Control key:** Use the Control key to adjust the position of the cursor in the third dimension when placing the first three points. This will define the plane in which the polygon is drawn.
- **The Shift key:** Hold down the Shift key to constrain lines to the two axes of the plane in which you are drawing. Constraining lines will display.
- **The Command key:** Hold down the Command key to draw a line tangent or perpendicular to the previous line or curve. Constraining lines will display.

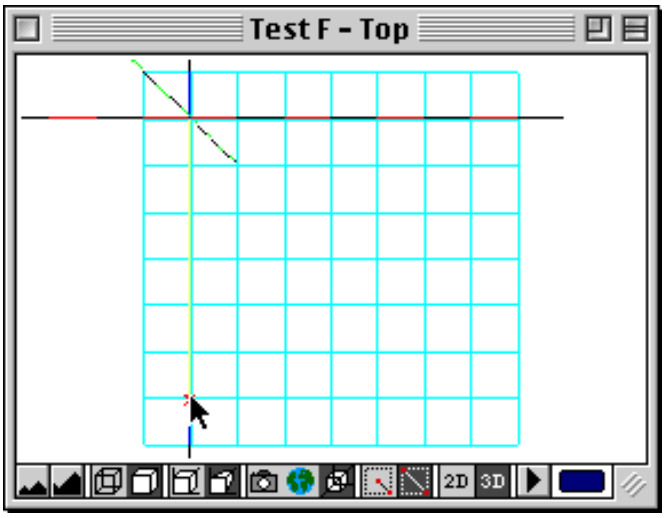
## ◆ Lathe

The Lathe plug-in is used to define a lathe template and produce a lathed geometry from it.

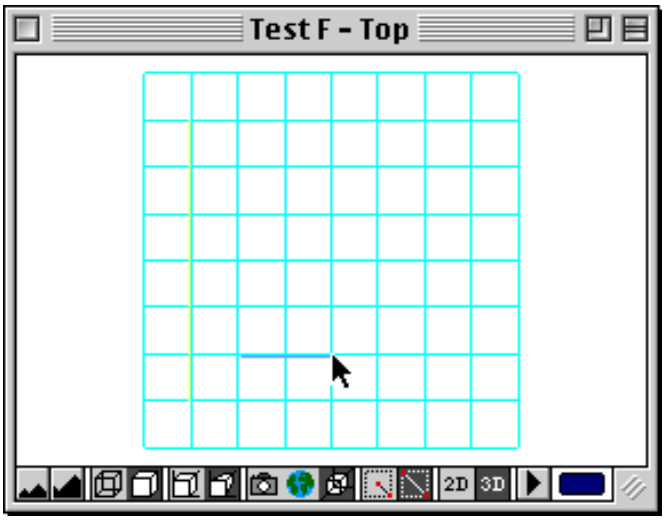
### Drawing a Lathe Template

1. Select the Lathe plug-in from the Tools palette.

2. Determine the lathe axis by clicking once, moving the cursor, and clicking a second time. Note: The lathe axis is constrained to either the X, Y or Z axis. A yellow line representing the axis your object will be lathed around displays:

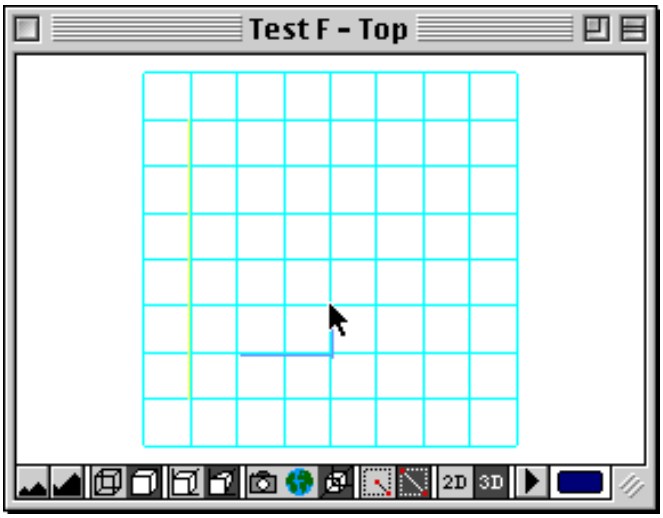



3. Position the cursor at the point to start drawing the lathe template. Click the mouse button to place a vertex point, move the cursor the desired distance and click again:

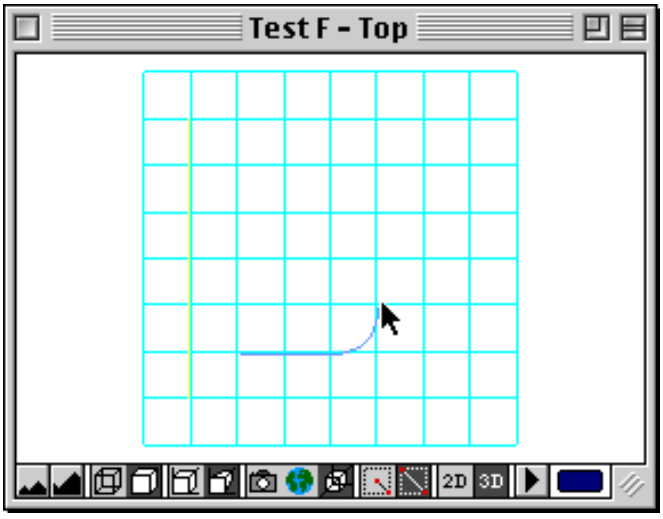



Note: To draw an object with have a hole in the middle, draw the lathe template so that it does not touch the lathe axis. If the template does touch the lathe axis at some point, the resulting geometry will not have a hole in the middle.

4. To draw an arc, hold down the Option key and click on the point that will represent the center of a circle:

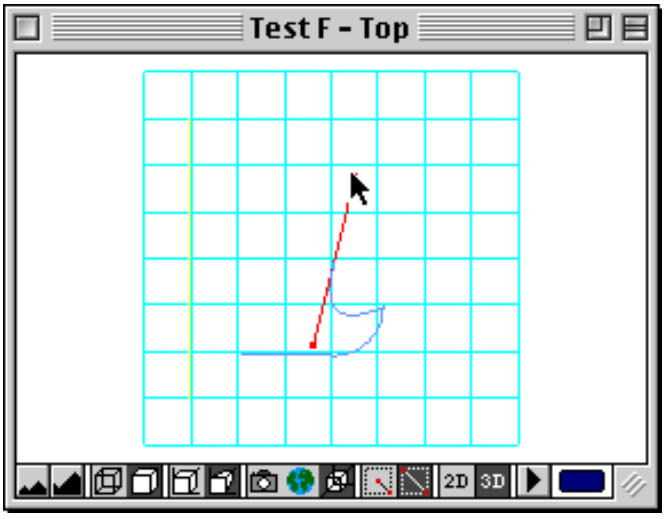



5. Release the Option key and the mouse button and move the cursor ready to place the next point. The arc will appear:

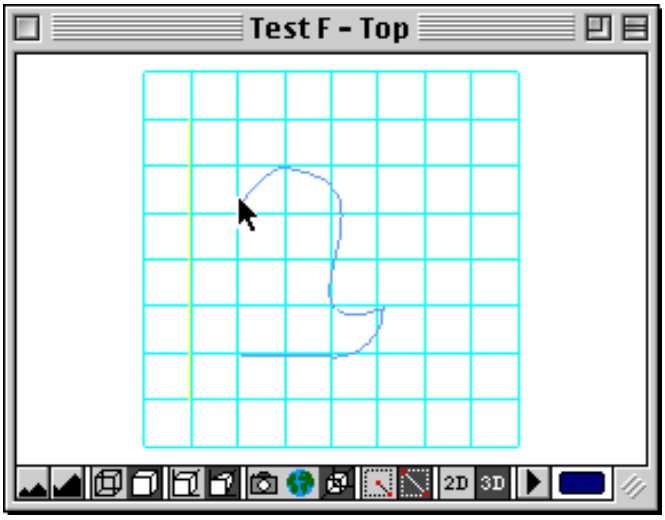



6. Click to place the next point at the end of the arc.

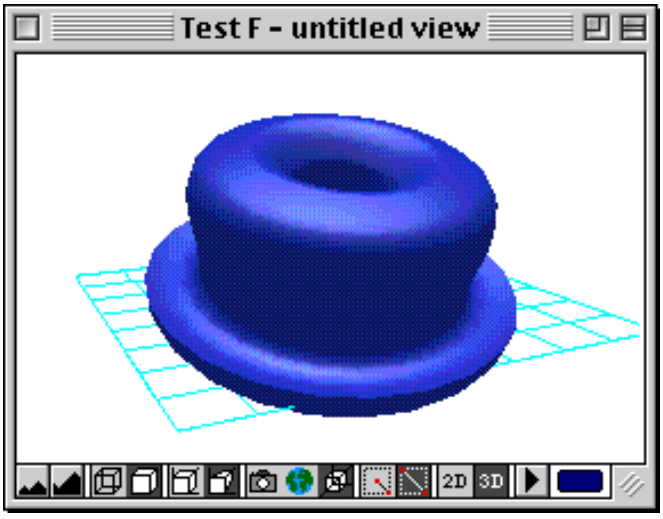
7. To draw a Bezier curve, click and drag the cursor:




8. To draw a spline curve, hold down the Option key and click and drag the cursor:



9. Double-click to lathe a geometry from the template:

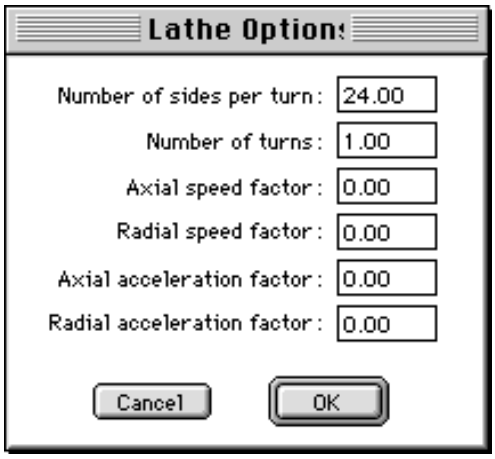



At any time while drawing the lathe template:

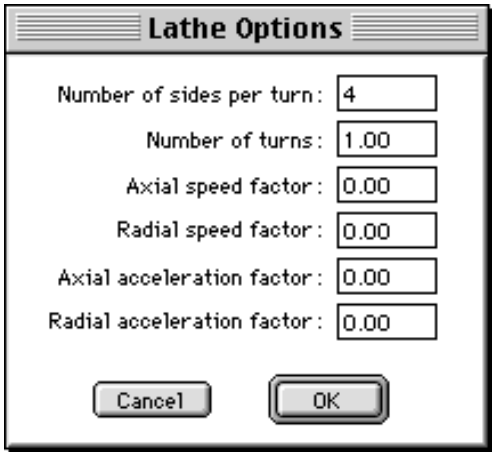
- Hold down the Shift key to constrain lines to one of the two axes of the plane you are drawing in.
- Hold down the Command key to draw a line tangent or perpendicular to the previous line or curve. Constraining lines will display.
- Use the Delete key to delete the last point placed.

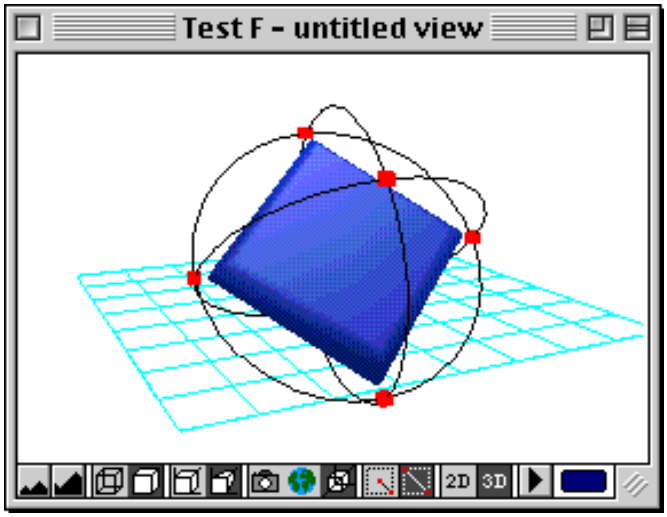
### Lathe Options

Hold down the Option key and click on the Lathe tool to display the Lathing Options dialog:



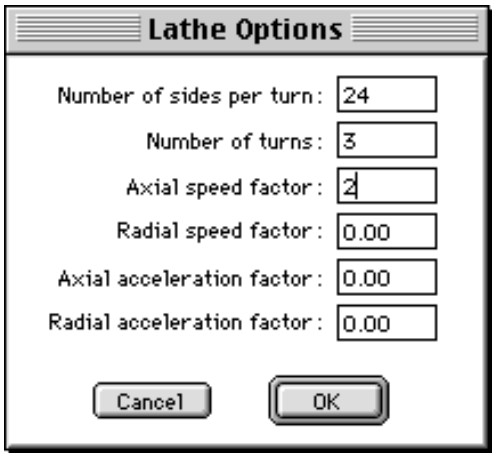

- **Number of sides per turn:** The number of sides the resulting lathed object will have. The default value is 24 which approximates to a circle. Type in a value for the number of sides, close the dialog and produce the lathed object.

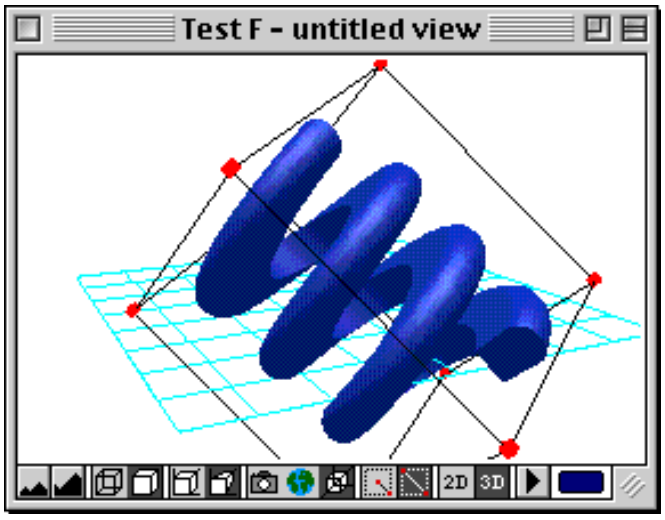


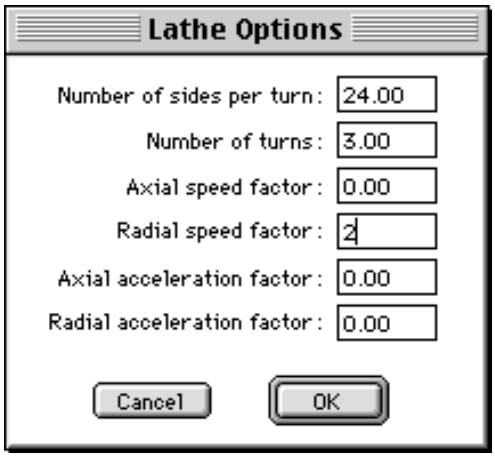

- **Number of Turns:** The number of times the lathed template should be turned. This option will have no effect unless at least one of the other Lathing Options is also changed.
- **Axial Speed Factor:** This is the initial speed of a lathe template along its axis. As an object is lathed, the template can be moved along the axis to produce a helix. The distance it is

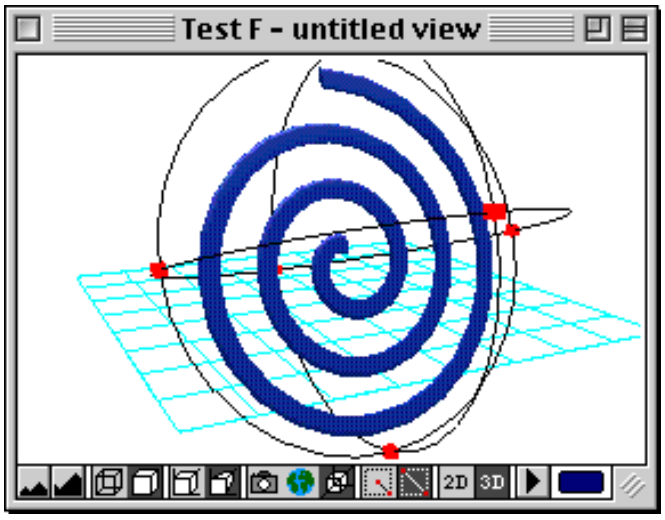
moved per turn is determined by the height of the lathe template multiplied by the axial speed factor:



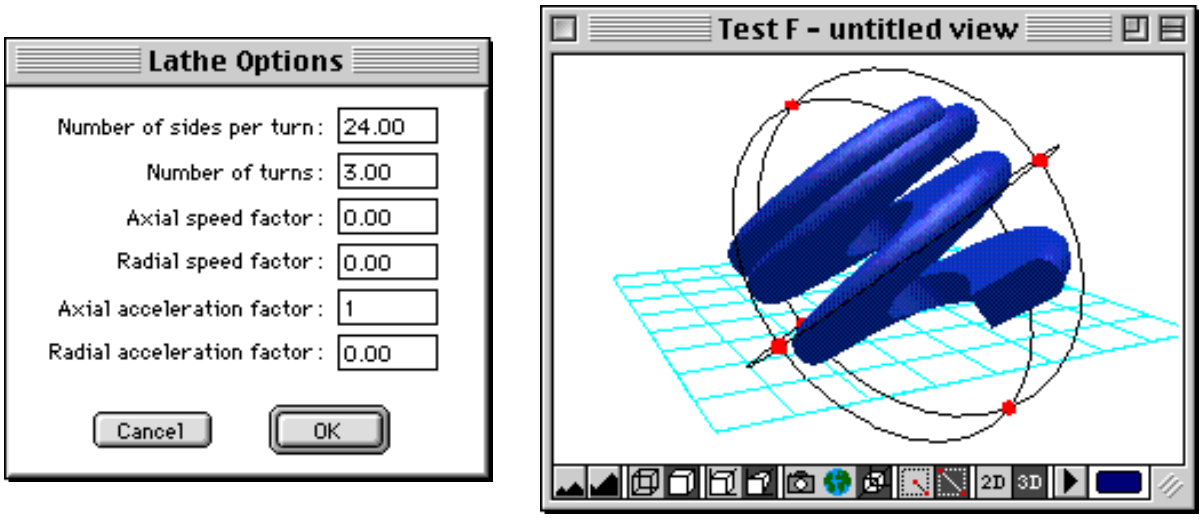

- **Radial Speed Factor:** As an object is lathed, the template can be moved away from or towards the axis to produce a spiral. The distance it is moved per turn is determined by the distance of the template's outside edge from the axis, multiplied by the radial speed factor. This is the initial speed of the template, perpendicular to its axis:



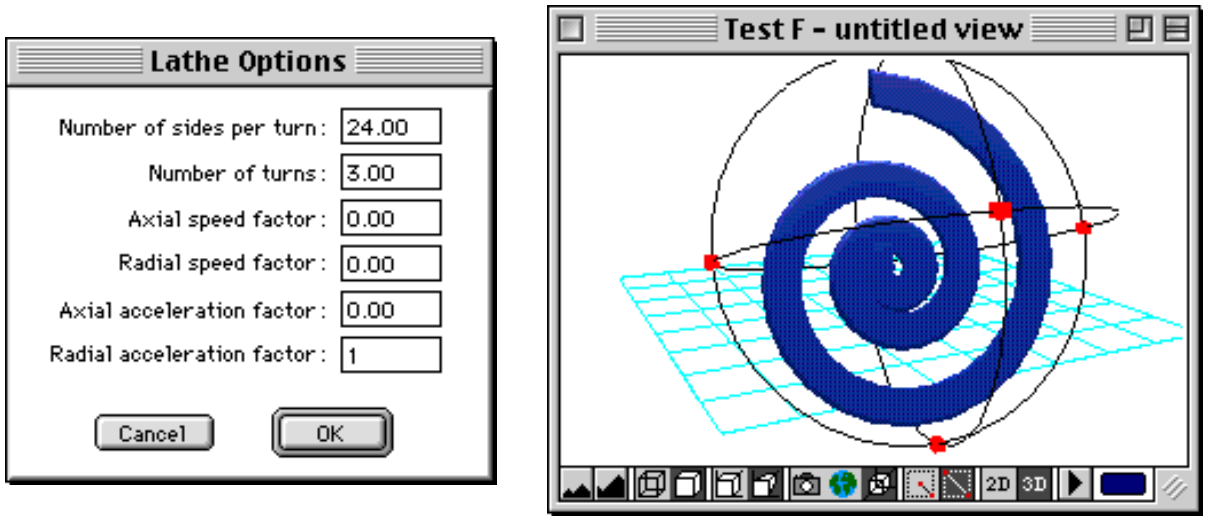




- **Axial Acceleration Factor:** As previously described, the axial speed factor allows you to set an initial speed for a lathe template moving along its axis. The axial acceleration factor allows you to specify whether this speed should increase or decrease with the number of

turns. The speed per turn is increased by the template's current height, multiplied by the axial acceleration factor:



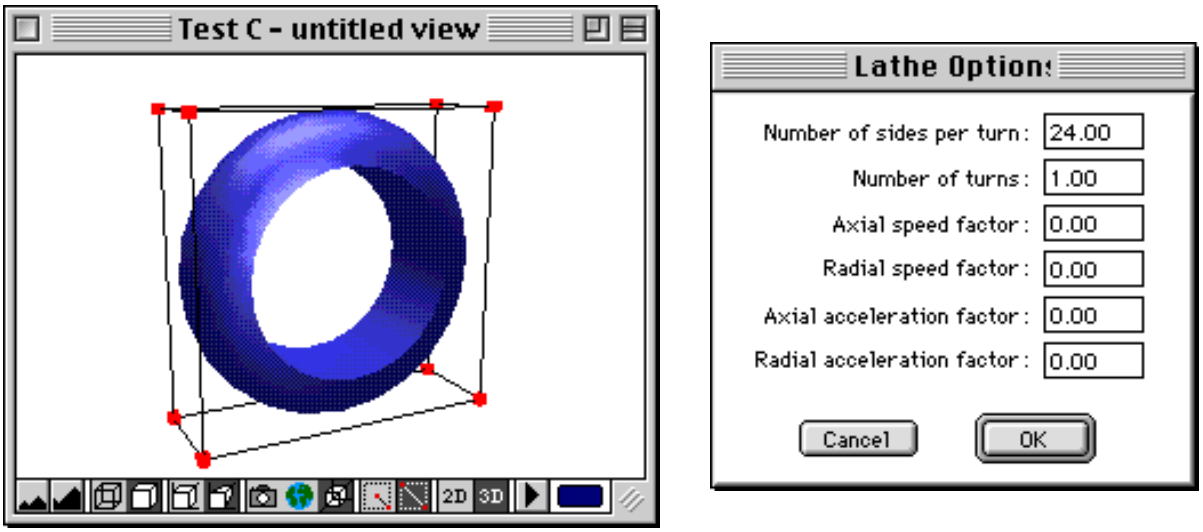

- **Radial Acceleration Factor:** As previously described, the radial speed factor allows you to set an initial speed for a lathe template moving perpendicular to its axis. The radial acceleration factor allows you to specify whether this speed should increase or decrease with the number of turns. The speed per turn is increased by the current distance between the template's outside edge and the axis, multiplied by the radial acceleration factor:



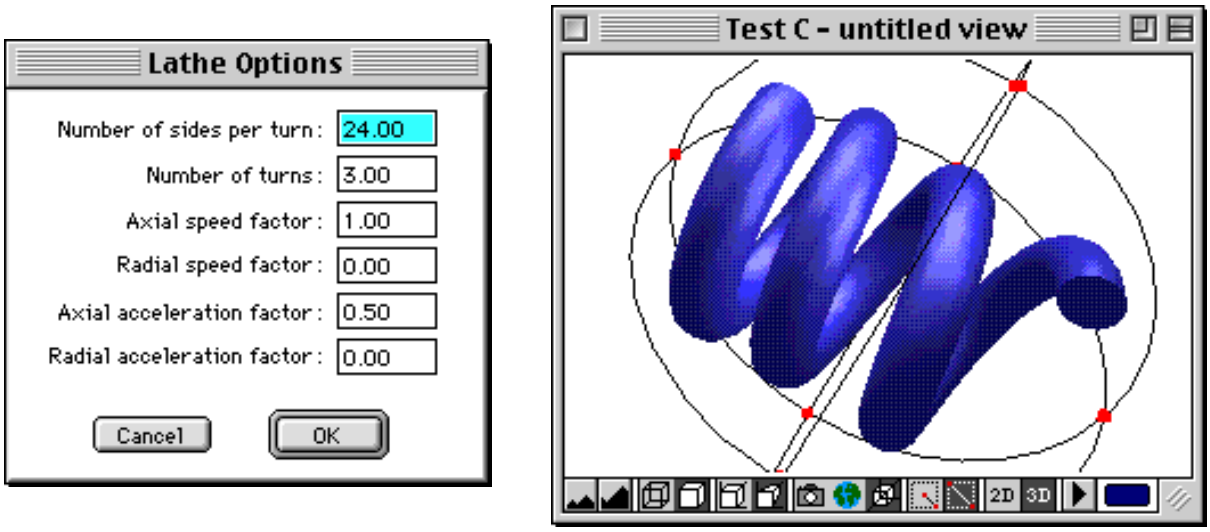
### Editing Lathed Geometries

Lathed geometries can be altered after they have been drawn, by changing the Lathe Options.

1. Select a lathed object in your 3D World document, hold down the Option key and click on the Lathe tool in the Tools Palette to display the Lathe Options dialog.




2. Change the settings in the dialog, click OK and the selected object will be re-lathed with reference to the new settings:

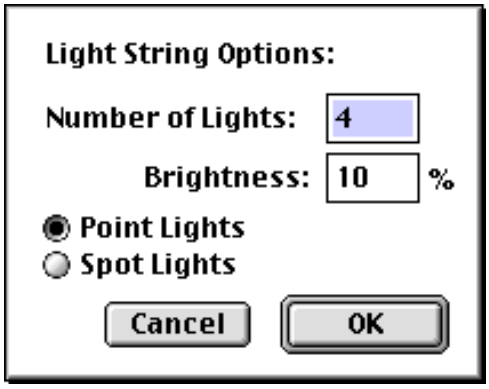


The path of a lathed geometry can be adjusted using the Edit Path tool to alter the axial and radial speed and acceleration and the number of turns of the lathe template. For some users this may provide a more intuitive method of adjusting a lathed object than using the Lathe Options. *See Editing the Path of a Lathed Object on page H-43 for more details.*

## ◆ Light String

The Light String tool is used to position a specified quantity of identical lights along a user-defined line. This is a useful tool for placing strip light effects, or regularly placed lights, quickly and easily into a scene.

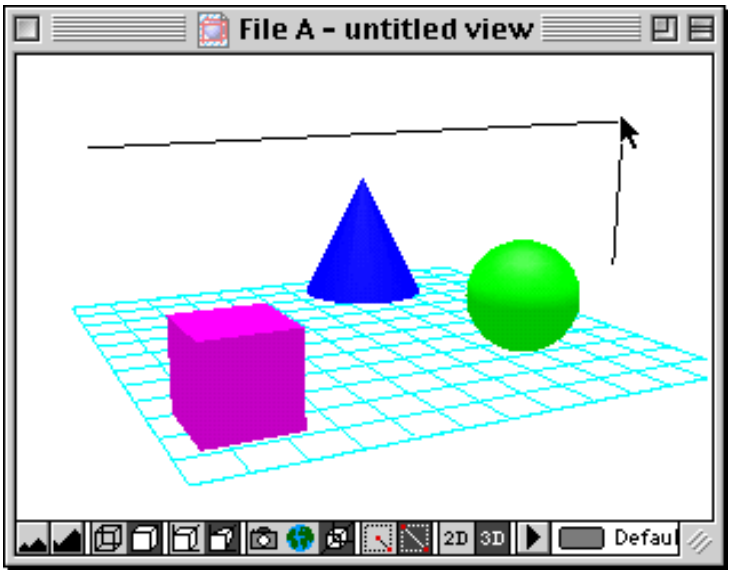
Hold down the Option key and click on the Light String tool in the Tools palette. The Light String Options dialog displays:



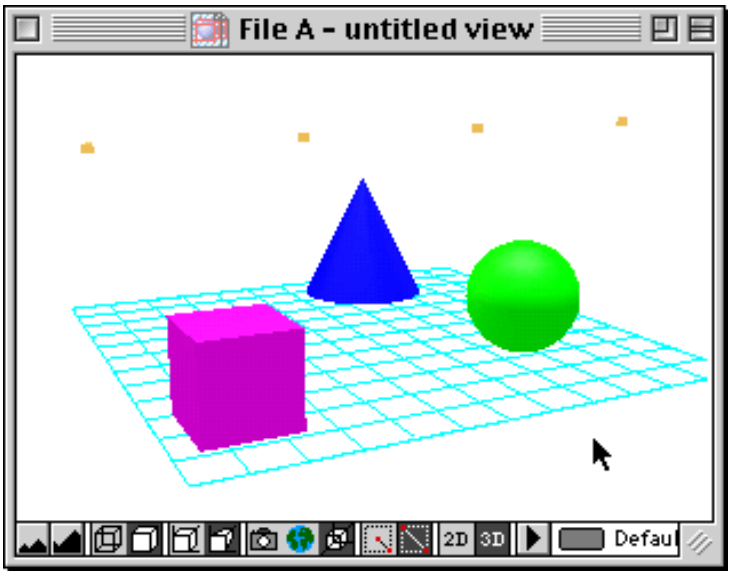

- **Number of Lights:** Enter a value in this field to specify the number of lights to be positioned along the light string. One light is placed at each end of the string with the others placed at equal distances between them.
- **Brightness:** Enter a value between 0% and 100% in this field to set the brightness of each light on the light string.
- **Point/Spot Lights:** Use these radio buttons to specify whether the lights should be point or spot lights. *See Point Light on page G-47 and Spot Light on page G-60 for further details.*

Close the dialog. The settings will remain as specified until they are changed.

With the Light String tool still selected, click in the document window to position one end of the string. Holding down the mouse button drag out the light string and release the mouse button when the cursor reaches position for the end point of the line. Use the Control key to move in and out of the document.




The Light String is drawn with the specified lights placed at equal intervals along it.

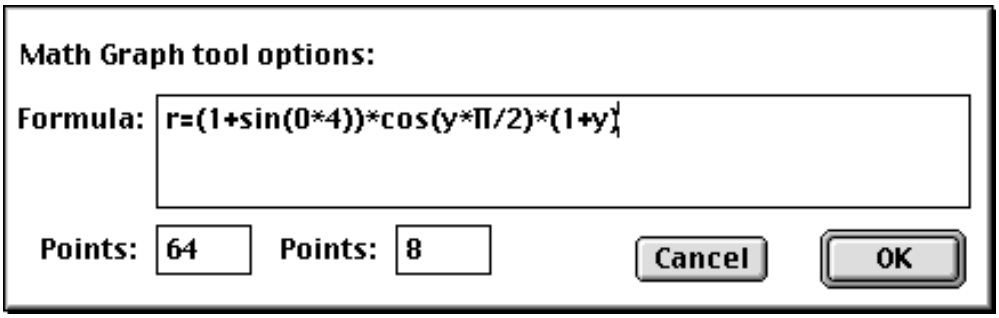


To edit the lights individually, select the light string and choose Dismantleable from the Options menu *(see Dismantleable on page 3-37 for more information),* then select Ungroup from the Edit menu. The lights can then be edited/repositioned individually.

## ◆ Math Graph

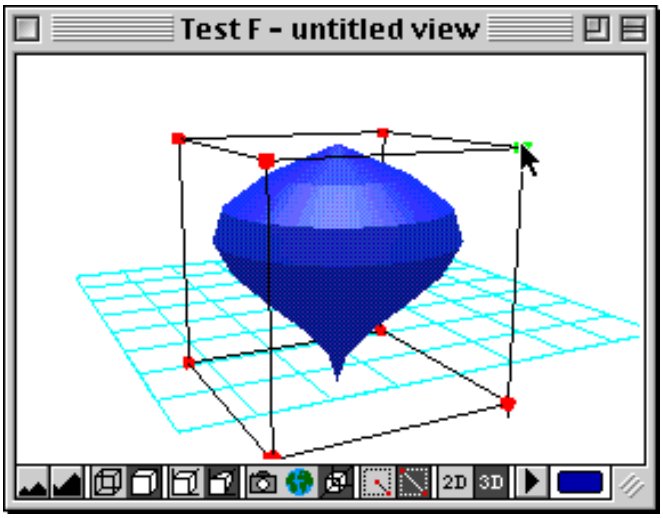
The Math Graph plug-in is used to enter a 3D geometry based on a mathematical formula.

1. Hold down the Option key and select the Math Graph plug-in in the Tools palette. The Math Graph tool options dialog displays:




2. Enter a formula in the Formula field and values in the points fields and click OK.

3. With the Math Graph tool selected, click in the document window and, holding down the mouse button, drag to create a geometry based on the formula.




The formula will remain as set until changed.

**Formulae:**

The formula can express either X, Y or Z in terms of the other two variables. The values of the two variables can range from -1 to +1, and the function value is scaled to fit within the same range. R and theta can also be used on the right hand side of the equation (the Ø symbol is used as there is not a real theta symbol in the Chicago font). Alternatively, R can be expressed in terms of theta and either X, Y or Z. At least one of X, Y or Z must be used to determine which axis R and theta are around, or 'Y*0+' can be used at the start of the equation. When entering formulae, the upper and lower case letters are equivalent.

Operators allowed in the function are:

(,) {sub expression}

^ {raise to power}

*, /, %, Mod {% is the 'C' modulo operator, and Mod is from Pascal}

+, -

>, <, =, ==, <=, ≤, >=, ≥, ≠, #, !=, <>

!, Not

&&, And

||, Or

value?value:value {C style conditional expression}

sin(radians), cos(radians)
atan(value), atan(value,value)
abs(value)
log(value)
exp(value)
sqrt(value)
max(value,.....,value)
min(value,.....,value)

Operands allowed in the function are:

constants e.g. 1, .1, 0.001, 1000.01
X, Y, Z
π or ∏ [option P]
ø or Ø {theta, which is atan2 (Y, X)}[option O]
R {sqrt(X*X + Y*Y)}
Rand {a random number -1 to +.999999}
T {time: current animation time expressed in seconds}

Some example formulae are:

Z=X^2+1/Y
Z=Sin(x*8*π)+Sin(x*8*π)
Z=r
Z=ø
Y=Rand?0:1
R=(sin(ø*14))+sqrt(1-y*y)*16

**Note:** in the first example there is a divide by zero in the first equation at Y=0, where a value of zero is assumed so that the surface can be whole.

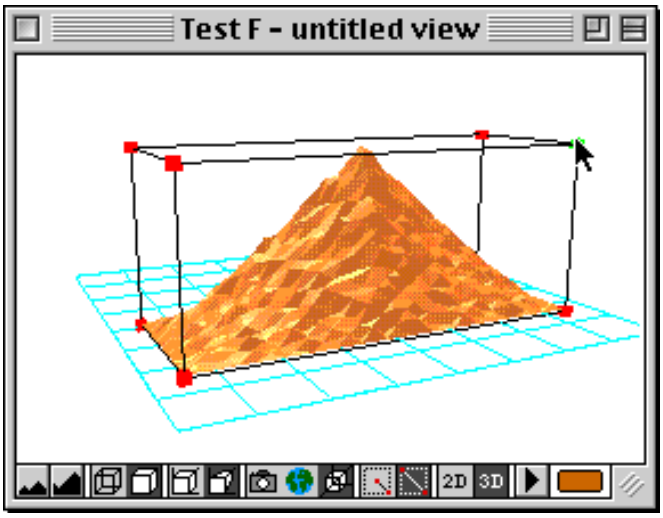
#### Points

The dialog allows you to enter two values, both called Points. These are the number of samples of each of the input parameters. The value they have depends on the combination used. The possible combinations are: XY, XZ, YZ, XØ, YØ, ZØ. In each case the left hand one of the pair maps to the left hand value in the dialog.

## Mountain

The Mountain plug-in is used to create a single mountain peak.

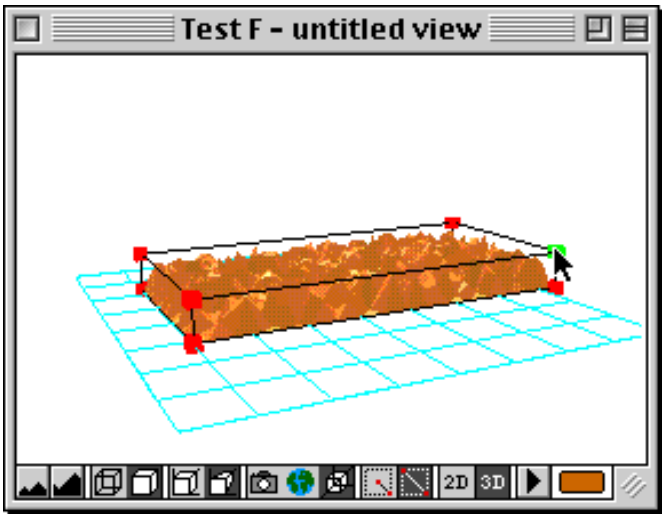
Select the Mountain plug-in from the Tools palette. Click on the grid and drag out a mountain geometry. This will have a classic “Mount Fuji” shape, although there will be a certain amount of randomness to the mountain’s slope.



## Mountains

The Mountains plug-in is used to create a range of mountain peaks.

Select the Mountains plug-in from the Tools palette. Click on the document grid and drag out the mountains geometry, which is a random set of peaks.

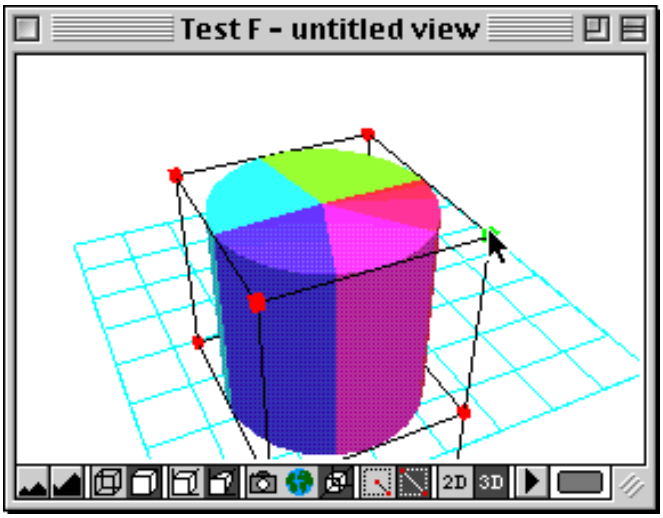



## Pie Chart

Use the Pie Chart plug-in to draw 3D Pie Charts.

1. Copy the data you want to chart onto the Clipboard (this will probably be from a spreadsheet, although other similar tab delimited text formats can be used).
2. Select the Pie Chart tool from the Tools palette.

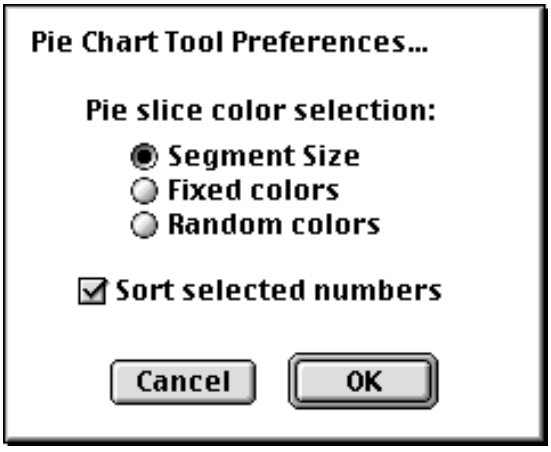
3. Click on the grid and drag out the pie chart. Hold down the shift key to constrain the cross-section to a circle, the height can be adjusted afterwards.




Pie charts are made up of slices of a cylinder. To move or change the color of any slice, flag the pie chart as Dismantleable, ungroup it and manipulate the slices independently. *See Dismantleable on page 3-37 and Primitive/Dismantleable Flag on page 4-18 for further details.*

To change the Pie Chart tool preferences:

1. Hold down the Option key and click on the Pie Chart tool. The Pie Chart Tool Preferences dialog displays:




2. Click on one of the Pie slice color selection radio buttons to choose the colors to use for the pie chart.

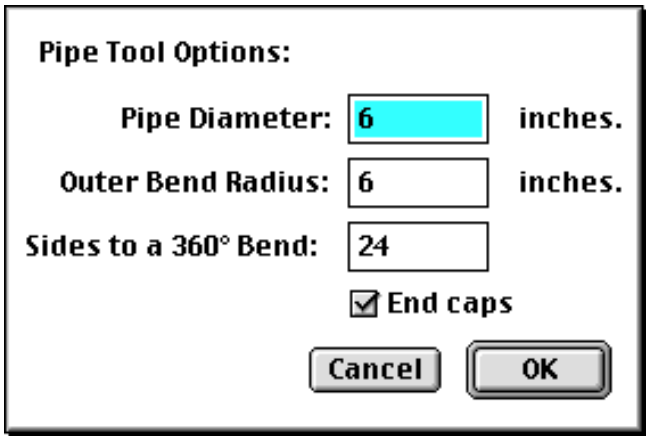
- **Segment Size:** This option specifies that a color should be applied to each segment according to the size of the segment and its position in the pie chart. The color used is calculated from the color wheel using the above factors.
- **Fixed colors:** Choose this option to apply one of a set of seven basic colors to each slice of your pie chart. The Colors are applied in turn, the eighth slice is given the same color as the first slice, and so on.
- **Random colors:** Click on this radio button to have random colors applied to each section of the pie chart.

3. Check the Sort selected numbers check box if you want the numbers used for the pie chart to be sorted into size order before the pie chart is drawn. In this case the slices of the pie chart will be arranged in size order.

## ◆ Pipes

The Pipes plug-in is used to draw pipe geometries.

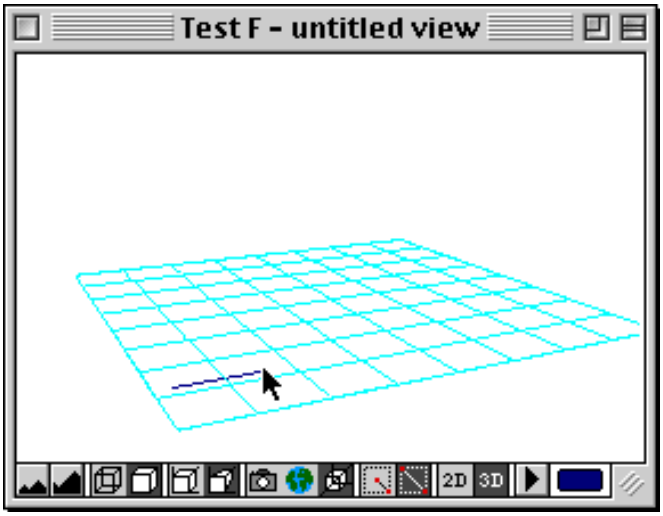
1. Hold down the Option key and select the Pipes tool from the Tools palette to display the Pipe Tool Options dialog:



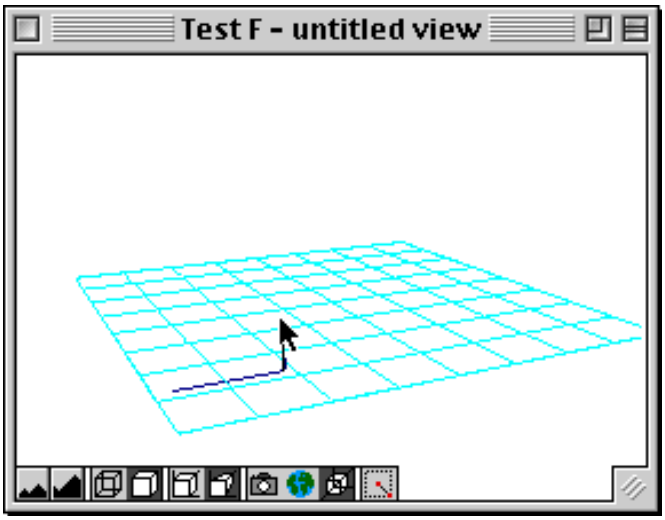

2. Enter a value in the Pipe Diameter field to specify the width of the pipe.

- **Enter zero:** A polyline will be drawn. This will be drawn as one pixel thick, regardless of the view, and may be useful when defining a path to use with the animate camera or animate object plug-ins. *See Animate Camera on page C-4 and Animate Object on page H-23 for further details.*

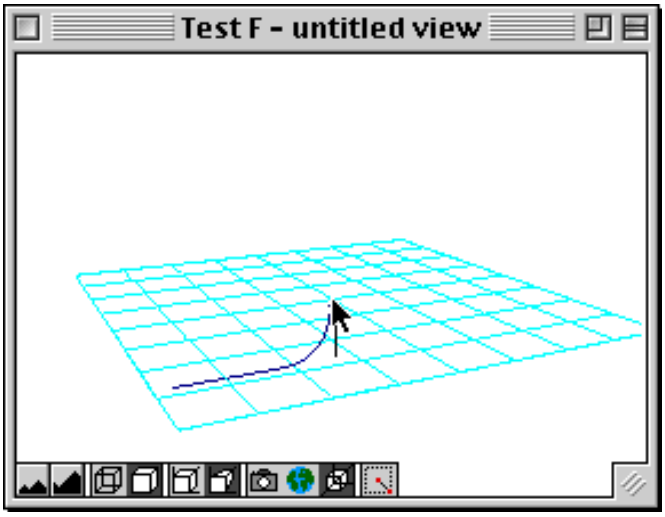
3. Enter a value in the Outer Bend Radius field to specify how the bends in the pipe should be drawn.
   - **Enter zero:** Mitred joints will be generated.
   - **Enter half the pipe's diameter:** The outer half of the joint will be radiused and the inner half mitred — just like a pipe elbow.
   - **Enter a value more than the pipe's diameter:** Gradual bends will be generated (if there is not enough straight pipe on each side of the bend to generate gradual bends, the length of the curve will be reduced).
4. Enter a value in the Sides to a 360° Bend field to determine the accuracy with which bends in the pipe are formed. (The 3D World Edges to a circle preference controls the number of vertices used to form each cross section of pipe. *See Options on page 3-25 for further details.*)
5. Check the End caps checkbox if you wish the pipe to be sealed at both ends.
6. Click OK, the options will remain as set until changed.
7. With the Pipes tool still selected, position the cursor where you want to begin drawing, click the mouse button to place a vertex point, move the cursor and click again:



8. To draw an arc, hold down the Option key and click at the point that will represent the center of a circle:

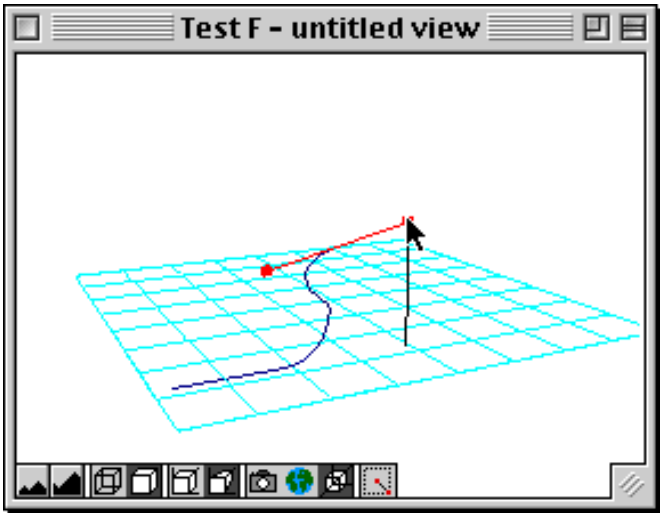



9. Release the Option key and mouse button and move the cursor ready to place the next point. The arc will display:

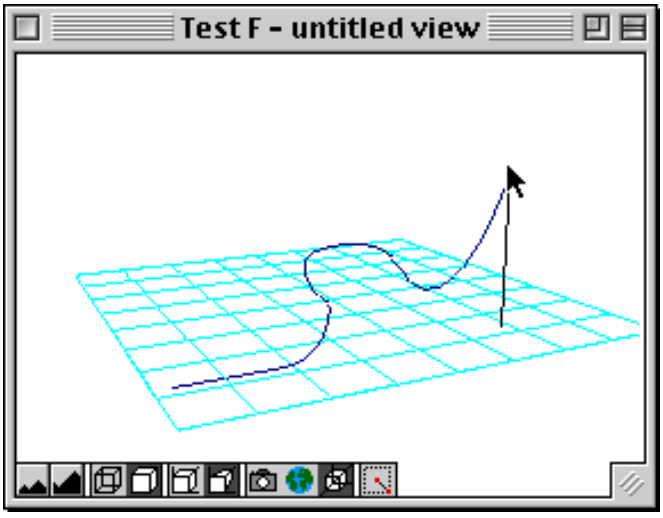



10. Click to place the next point at the end of the arc.

**11.** To draw a Bezier curve, click and drag the cursor:

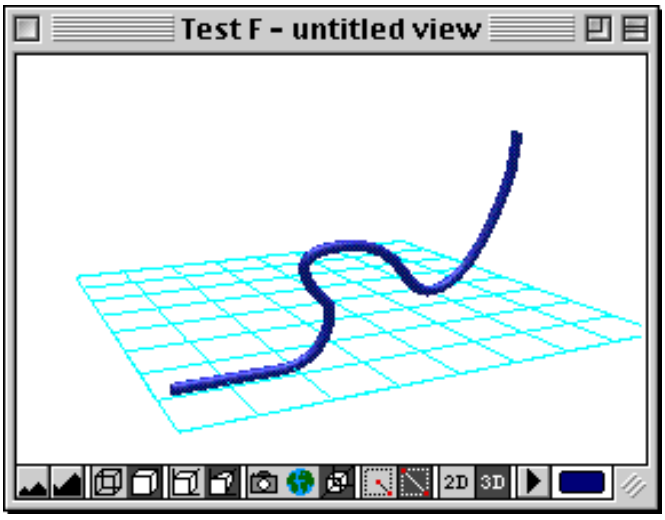



**12.** To draw a spline curve, hold down the Option key and click and drag the cursor:




**13.** Use the Delete key at any time to delete the last point placed.

14. Double-click at any time to complete the shape:




Hold down the Shift key while drawing the pipe path to constrain the path to the X, Y, or Z axis. To move in the Z dimension, hold down the Control key.

To break the pipe down into the bends and straight sections that make it up, flag the pipe as Dismantleable and ungroup it. *See Dismantleable on page 3-37 and Primitive/Dismantleable Flag on page 4-18 for further details.* Each component of the pipe can now be manipulated separately.

If you apply a pattern to a pipe, the number of pattern repeats along the pipe will be determined by the pipe's circumference.

## ◆ Point Light

Use the Point Light plug-in to place point lights in your 3D World document. Point lights radiate light in all directions.

**Note:** Light objects are visible by default. If you have turned off the Show Lights option in the Lights palette, the light objects will not be displayed. *See Lights on page D-70 for more details.*

Select the Point Light tool in the Tools palette and click in the document window. The light is placed at the point clicked.

A point light is displayed as a small sphere and when selected has a bounding sphere. Point lights cannot be resized, but can be moved and rotated like other objects. Note that rotating a point light will not have any affect on the lighting in the document.

Hold down the Command key when placing a point light and, if the scene is rendered using a third-party renderer that draws shadows, that particular light will not cast any shadows.

Hold down the Option key when placing a point light and a light with a negative brightness value will be placed in the document. The negative brightness value can be adjusted using the Brightness slider in the Info palette as usual. To adjust a light with a negative brightness value so that it has a positive brightness value, set the brightness to 0 in the Info palette, then adjust brightness as for an ordinary point light.

The Info Palette is used to specify the color and brightness of a selected point light. *See Info Palette on page 4-16 for further details.*

The color of the point light sphere is set in the Preferences dialog. *See Preferences on page 3-24 for further details.*

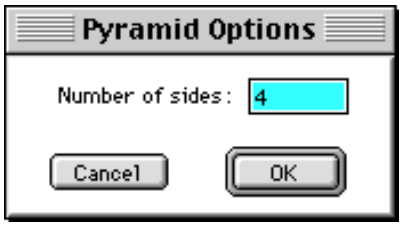
#### Lighting Control and Manipulation

*See Lights on page D-70 for more details.*

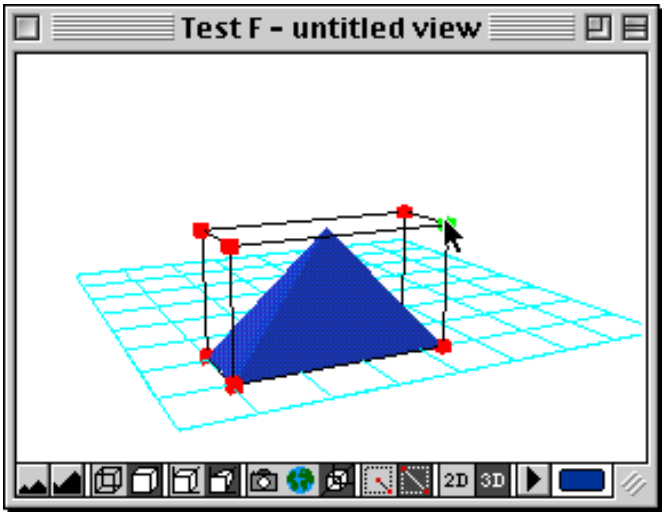
## ◆ Pyramid

The Pyramid plug-in is used to draw pyramid geometries with a specified number of sides.

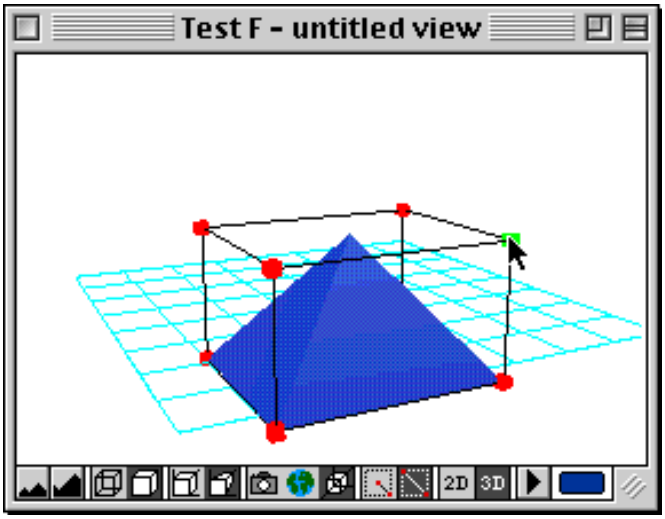
1. Hold down the Option key and select the Pyramid plug-in from the Tools palette to display the Pyramid Options dialog:



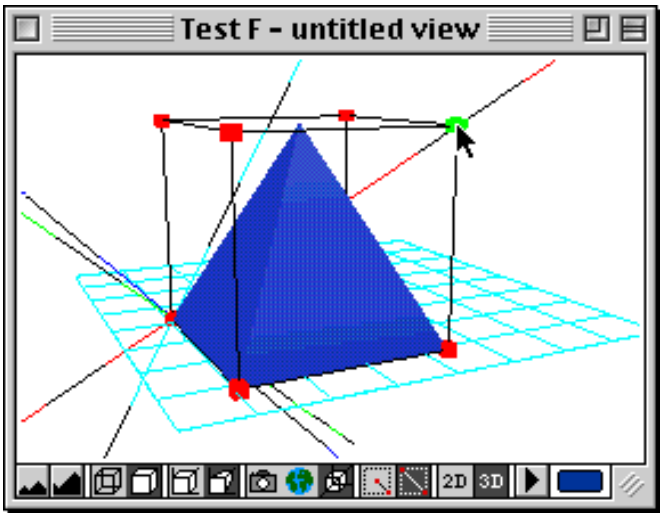
2. Enter a value in the Number of sides field to specify the number of sides the pyramid should have.
3. Place the cursor at the point to begin drawing, hold down the mouse button and drag to create the pyramid geometry:




4. Hold down the Control key and move the mouse up or down to change the depth of the pyramid. Release the mouse button when the pyramid reaches the desired size:



5. Hold down the Shift key while drawing the object to constrain the base of the pyramid so that each side is the same length, and constrain the height of the pyramid to the diameter of an imaginary circle that touches all the points of the base:

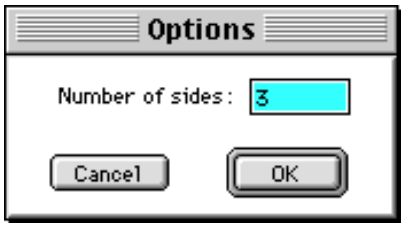



In 2D mode, you will not be able to create a 3D object, and holding down the Shift key will constrain the object shape to a polygon with equal sides, or to a triangle, depending upon which plane you are drawing in. Using the Control key in 2D mode will not add depth to an object, but you can use it to draw your 2D shape in the Z dimension.

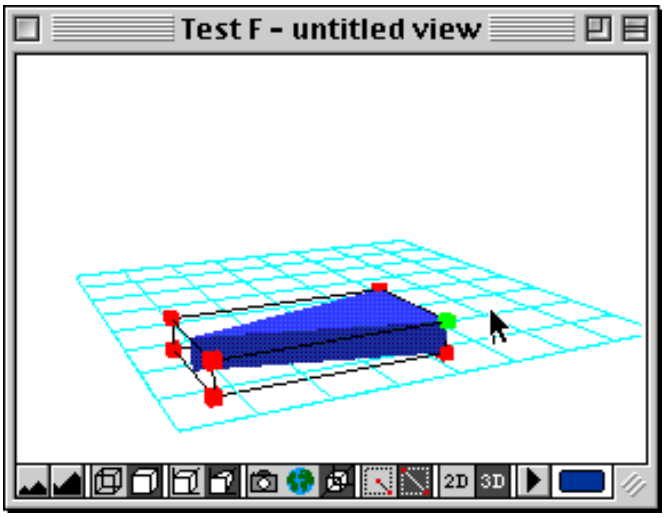
## ◆ Regular Polygon

The Regular Polygon plug-in is used to draw regular polygons with a specified number of sides.

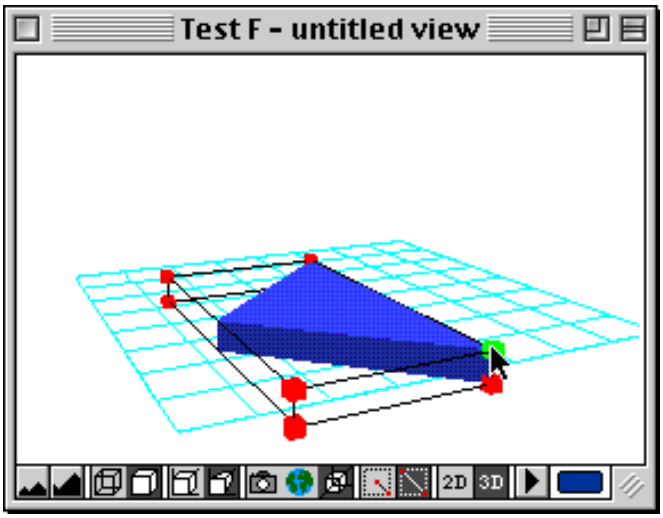
1. Hold down the Option key and select the Regular Polygon plug-in in the Tools palette to display the Regular Polygon Options dialog:



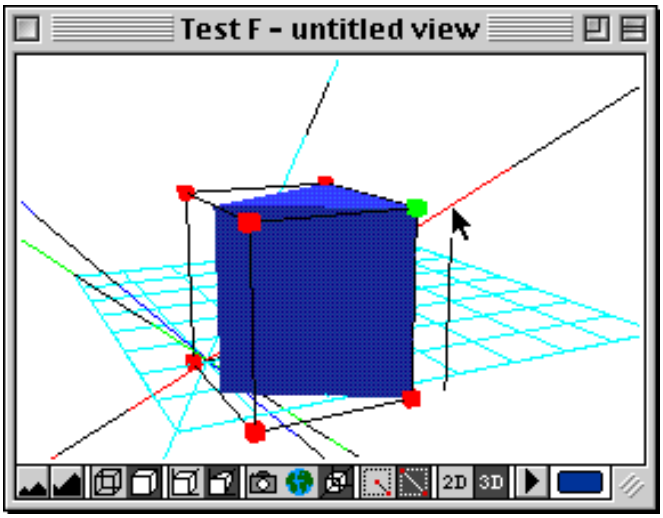

2. Enter a value in the Number of sides field to specify the number of sides the regular polygon should have. The number of sides will remain as specified until you change it.
3. Place the cursor at the point to begin drawing, hold down the mouse button and drag to create the regular polygon:



4. Hold down the Control key and move the mouse up or down to change the depth of the regular polygon. Release the mouse button when the polygon reaches the desired size:




5. Hold down the Shift key while drawing the object to constrain the cross section of the polygon so each side is the same length, and constrain the height of the shape to the diameter of an imaginary circle that touches each point of the base of the polygon:



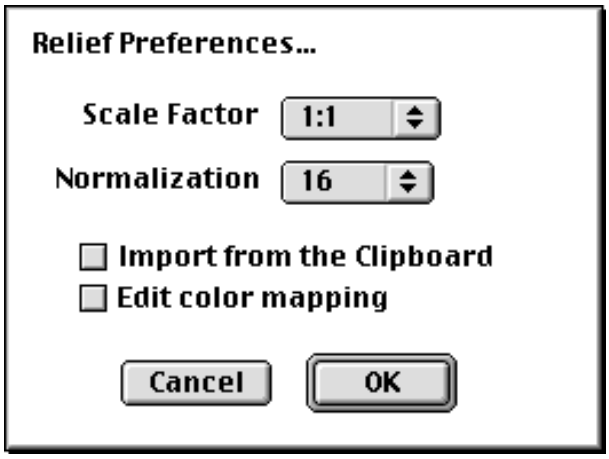

In 2D mode, you will not be able to create a 3D object and holding down the Shift key will constrain the object shape to a polygon with equal sides, or a square, depending upon which plane you are drawing in. Using the Control key in 2D mode will not add depth to an object, but you can use it to draw your 2D shape in the Z dimension.

## Relief

The Relief plug-in is used to create a 3D surface from a picture contained in a PICT file, the clipboard, or a picture clipping. Each pixel in the source picture is mapped onto a point on the 3D surface, the color of the pixel defining the height of that point.

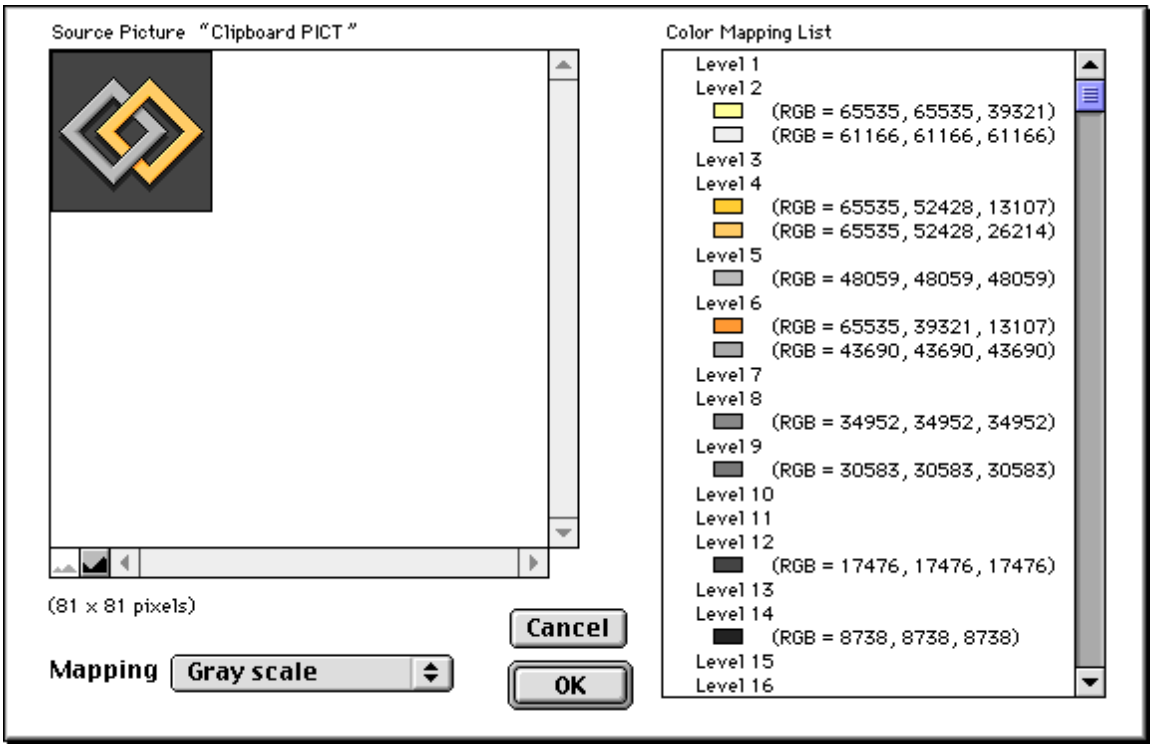
Using the default options, the source picture is converted into a gray scale image of 256 gray colors. The 3D surface will have 16 possible levels with level one being the lowest. Hence pixels in the source picture that convert to one of the 16 lightest gray colors will be plotted with the lowest height. Pixels that convert to the next 16 gray colors will be plotted at the second lowest height, etc. If the source picture contains only 16 gray colors then each shade of gray in the source picture will convert to an individual height, giving a direct mapping between gray color and height.

Select the Relief tool from the Tools palette. To change the Relief options, hold down the Option key and click on the Relief tool again. The Relief Preferences Dialog displays:




- **Scale Factor:** Select a scale factor from the Scale Factor popup menu to change the size of the source image before it is mapped as a 3D object.
- **Normalization:** Select a value from the Normalization popup menu to change the number of levels in the 3D surface. To perform a direct mapping of color to level for a source picture with 256 gray colors in it, select a normalization of 256. Note: The process of mapping colors to levels when there could be more colors than levels is called normalization.

- **Import from the Clipboard:** Click the Import from the Clipboard check box if the source picture is on the clipboard rather than in a file. If this checkbox is not checked, when you select the Relief tool and click in the document window, a standard dialog will display for you to locate the file to be mapped.
- **Edit color mapping:** Click the Edit color mapping check box to edit the mapping from colors in the source picture to levels in the 3D surface. If this checkbox is checked, after the source picture is selected and you click in the document window, the Color Mapping dialog will display:




The Color Mapping dialog allows you to manually adjust which color in the source picture maps onto which level in the 3D surface. The dialog contains the Mapping popup menu that allows the Mapping Lists to be saved, deleted or selected.

- **Viewer:** The viewer displays the source picture. Use the zoom in and zoom out buttons and the window scroll bars to change your view of the picture as required.
- **Color Mapping List:** Listed below each level and offset to the right are the colors that will be mapped at that level in the 3D surface. The default settings convert the image

to grayscale and map to 16 levels. As only the colors contained in the source picture are in the list, some levels may not contain any colors.

To change the level at which a color will be plotted, click on the color and, holding down the mouse button, drag it to the required level. As the cursor moves over the levels a red arrow will display to the left of the level. Release the mouse button when the red arrow is adjacent to the required level.

Use the Shift key to add further colors to your selection, and the Command key to deselect colors from a selection. To move all the selected colors, click on one of the colors and drag. Select all the colors in the list by typing Command-A, or all the colors in a level by clicking on the level. Colors in the list can also be selected by clicking on pixels in the source picture displayed in the viewer.

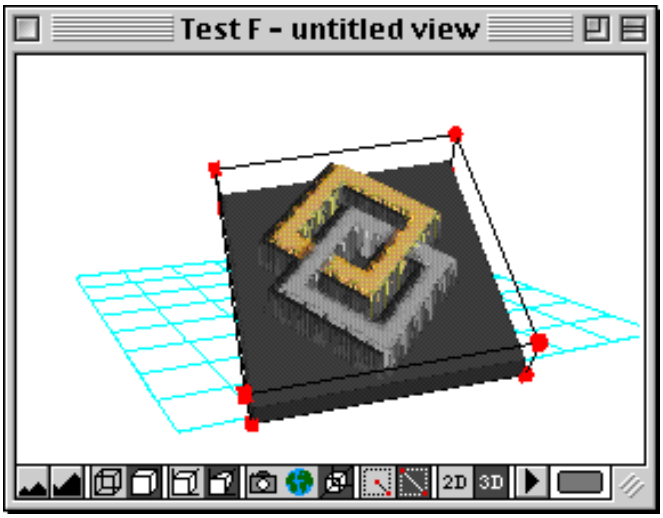
- **Mapping:** When you have finished editing the mapping of colors to levels, the list contents can be saved by selecting Save set from the Mapping popup menu.

  In the dialog that displays, enter a name for the mapping set and click Save. The new set will now be listed in the Mapping popup menu and can be used for other pictures to give the same result as the mapping for the first, assuming the pictures contain the same colors. If a subsequent picture contains a different color, that color will be mapped onto its default gray scale normalization level.

  To delete a saved mapping set, select Delete Set from the Mapping popup menu. A list of mapping sets that can be deleted will display. Select the appropriate set and click Delete to delete it.

Click OK in the Color Mapping dialog to accept the settings entered.

To draw the mapped 3D shape, select the Relief tool, click in the document window and drag out the shape, it can then be manipulated like any other 3D object.




**Note:** If the source picture is large, using this tool could require a lot of memory. The 3D surface plotted for a picture that is 80 by 80 pixels will contain 6400 points, for a picture that is 100 by 200 pixels, the surface will contain 20000 points. If the plot fails, reduce the size of the source picture by changing the scale in the Relief preferences dialog (this will decrease the resolution of the picture), or increase the application memory partition in the Get Info box for 3D World.

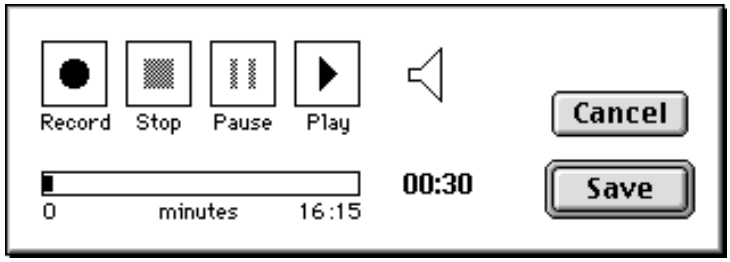
### The Relief Import Plug-in

The Relief plug-in is available as an import plug-in, accessed via the Import submenu in the File menu as well as a Plug-in Geometry. When selected from the Import submenu, it uses the settings currently in the Relief Preferences dialog. To change the Relief options, hold down the Option key when selecting Relief from the Import submenu to display the Relief Preferences dialog.

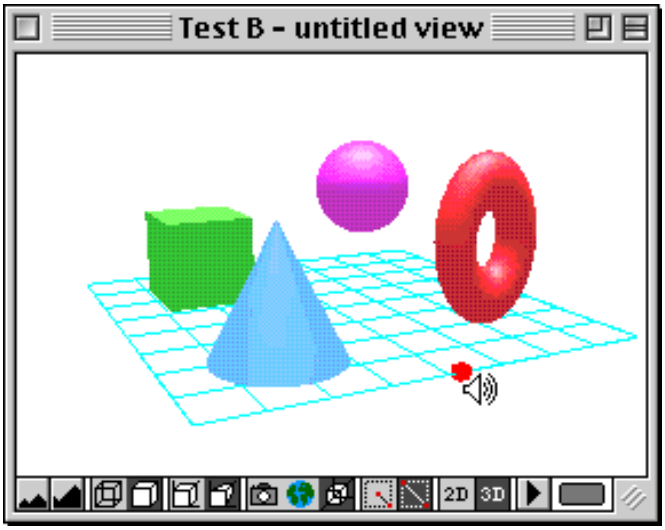
## Sound Marker

Use the Sound Marker plug-in to place sound markers in the 3D World document. Sound markers are placed in specific locations, but always display perpendicular to the camera. A sound marker displays as the standard Macintosh sound icon.

1. Select the Sound Marker tool in the Tools palette.
2. Move the cursor over the window, it will become a sound icon.
3. Click to place the sound marker and the Record dialog will display. Use the controls to record your sound.




4. Click on Save to close the dialog and place the sound marker in the document:

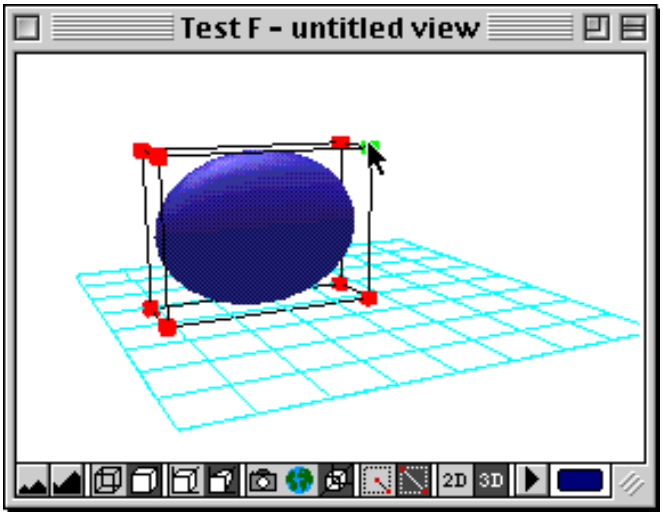



Double-click on the icon to play the sound. Ensure that the Sound On option is turned on in the Preferences dialog. *See Options on page 3-25 for further details.*

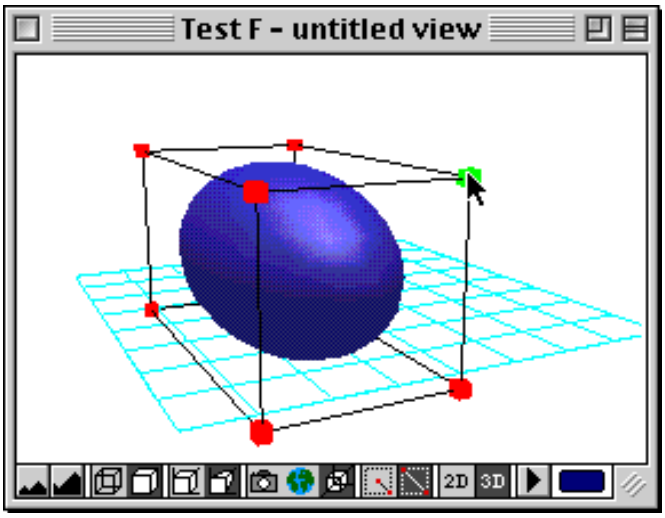
## Sphere

Use the Sphere plug-in to draw ellipses and spheres.

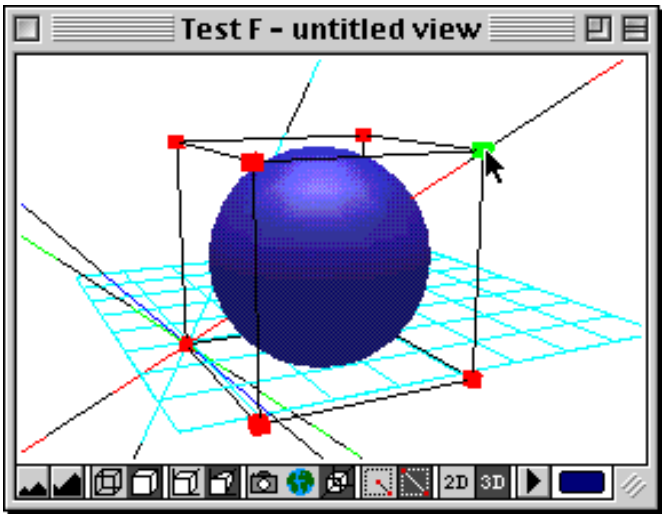
1. Place the cursor at the point you want to begin drawing, hold down the mouse button and drag to create an object:



2. Hold down the Control key and move the mouse up or down to change the object's depth. Release the mouse button when the ellipse/sphere reaches the desired size:




3. To constrain the shape of the object to a sphere, hold down the Shift key while drawing:




In 2D mode, you will not be able to create a 3D object, and holding down the Shift key will constrain the object shape to a circle. Using the Control key in 2D mode will not add depth to an object, but you can use it to draw your 2D shape in the Z dimension. *See 2D on page 4-33 for further details.*

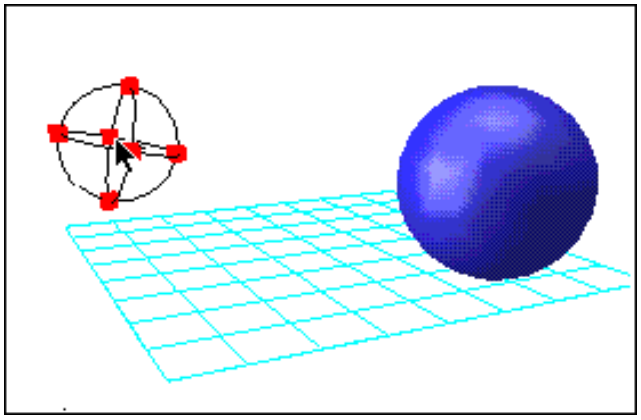
## Spot Light

Use the Spot Light plug-in to place spot lights in your 3D World document. Spot lights have a directional shade around them which can be rotated to direct light in a specific direction.

**Note:** Light objects are visible by default. If you have turned off the Show Lights option in the Lights palette, the light objects will not be displayed. *See Lights on page D-70 for more details.*

Select the Spot Light tool in the Tools palette.

- **To place a spot light at a specific position in the document:** move the cursor to that point, click and release the mouse button.
- **To direct the light as you place it in the document:** click on the point you wish the spot light to shine and drag the light into position before releasing the mouse button. Hold down the Shift key when dragging the light to constrain it to an axis perpendicular to the surface clicked on.



A spot light is displayed as an open, four sided pyramid with a line coming out of it. The line indicates the direction the light is pointing. When a light is selected it displays with a bounding sphere. Spot lights cannot be resized, but can be moved and rotated like other objects.

Hold down the Command key when placing a spot light and, if the scene is rendered using a third-party renderer that draws shadows, that particular light will not cast any shadows.

Hold down the Option key when placing a spot light and a light with a negative brightness value will be placed in the document. The negative brightness value can be adjusted using the Brightness slider in the Info palette as usual. To adjust a light with a negative brightness value so that it has a positive brightness value, set the brightness to 0 in the Info palette, then adjust brightness as for an ordinary point light.

The Info Palette is used to specify the color, brightness, spread and sharpness of a selected spot light. The Spread control adjusts the lens angle, while the Sharpness control adjusts the focus. *See Info Palette on page 4-16 for further details.*

The color of the spot light pyramid is set in the Preferences dialog. *See Preferences on page 3-24 for further details.*

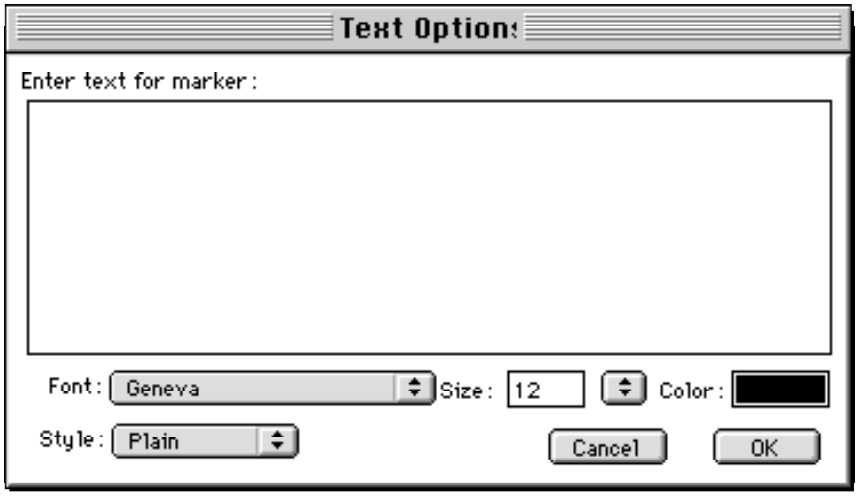
#### Lighting Control and Manipulation

*See Lights on page D-70 for more details.*

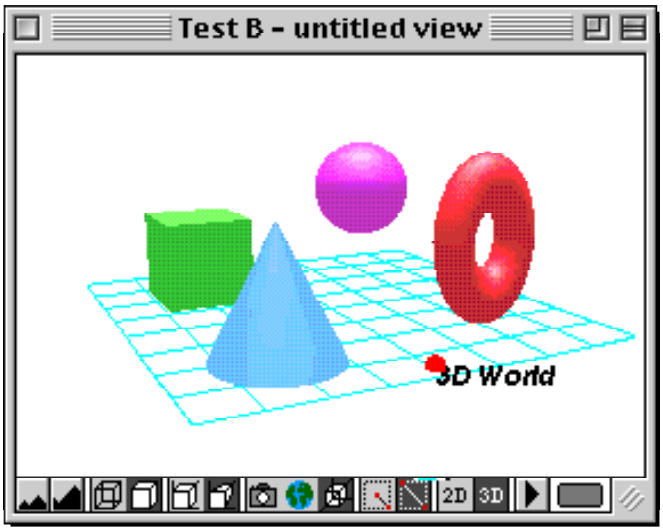
## ◆ Text Marker

Use the Text Marker plug-in to place text markers in your 3D World document. A text marker is placed in a specific location, but always displays perpendicular to the camera. Text markers display as an object handle with the specified text next to it.

1. Select the Text Marker tool in the Tools palette.
2. Move the cursor over the document window, it will display as a text insertion cursor.
3. Click to place the text marker and the Text Options dialog will display:




4. Enter the marker text, and select the font and style from the popup menus.
5. Enter a font size or select a size from the popup menu.
6. Click on the Color box to display the Color Picker if you wish to select another color for the text.
7. Click OK to close the dialog and place the text in your document:



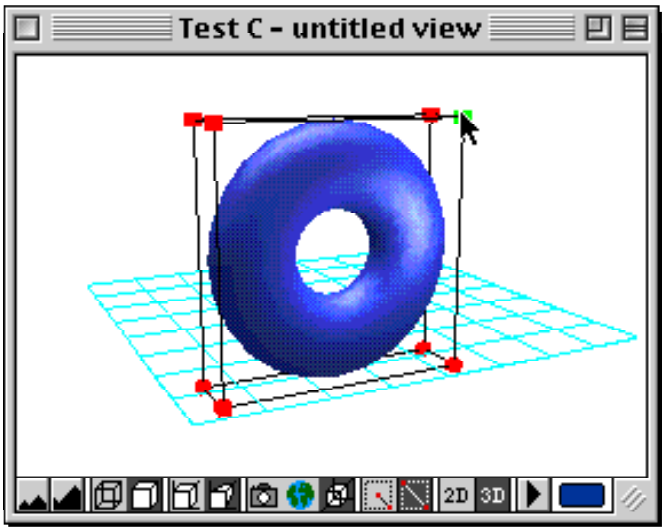

- **To move a text marker:** Select it and drag to reposition it, just as you would with any other object.

- **To edit a text marker:** Double-click on it to display the Text Edit dialog. Make your changes and close the dialog.
- **To change the color of a text marker:** Use drag and drop or the Info Palette, as with any other object. *See Info Palette on page 4-16 for further details.*

## ◆ Torus

Use the Torus plug-in to draw a torus geometry which is a shape like a doughnut.

Select the Torus tool from the Tools palette. Click on the grid and drag out a torus shape.




The torus is drawn with reference to the 3D World preference Edges to a circle. *See Options on page 3-25 for further details.*

To change the Torus options, hold down the Option key and select the Torus tool from the Tools palette again. The Torus Tool Options dialog displays:

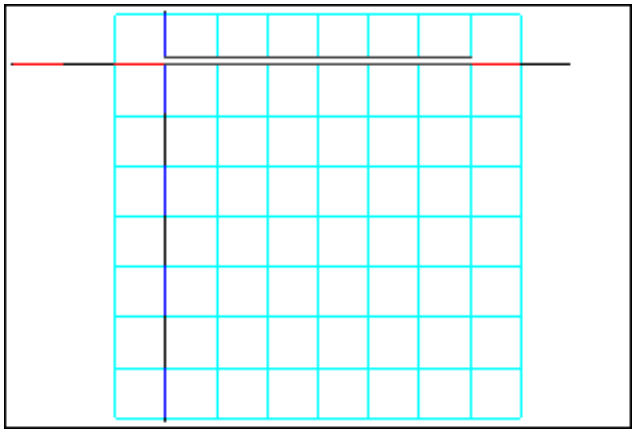
Enter a value in the Ring To Hole Ratio field to specify how thick the outer ring of the torus should be in relation to the diameter of the central hole.

- The default value of 1 will produce a torus where the thickness of the outer ring is the same as the diameter of the central hole.
- A value less than 1 will produce a torus where the thickness of the outer ring is the less than the diameter of the central hole.
- A value greater than 1 will produce a torus where the thickness of the outer ring is the more than the diameter of the central hole.

## Walls

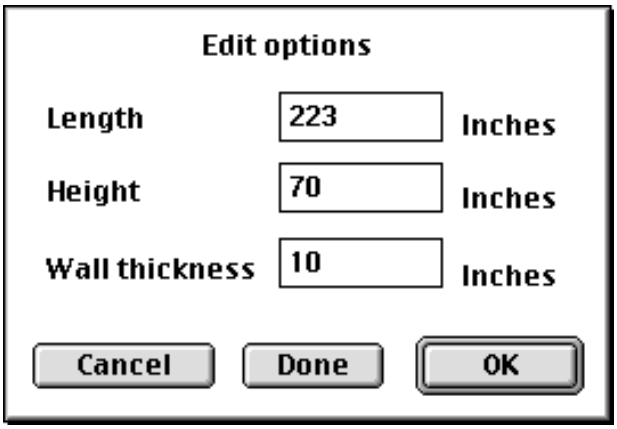
The Walls plug-in is used to create rooms other than those with four regular walls. Walls are always drawn perpendicular to the grid and resting on the grid.

1. Select the Walls plug-in from the Tools palette. The view will change to show an orthogonal, top view.
2. Click in the document at the point you wish to start drawing a wall. Holding down the mouse button, drag along one of the constrainer lines that display to draw the wall.



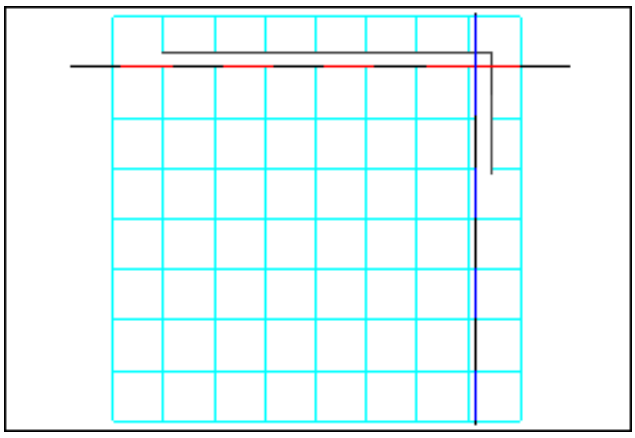
**Note:** Currently only perpendicular walls can be drawn. To enter walls with internal wall measurements, draw the room in a clockwise direction as viewed from above; to enter walls with external wall measurements, enter walls in an anti-clockwise direction as viewed from above.

3. Click at the point you want the wall to end. The Edit options dialog displays:

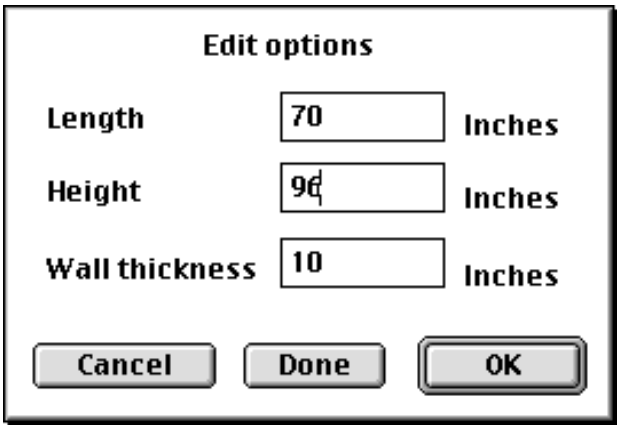



- If you have drawn the wall to exactly the correct length, and the default settings for the height and thickness of the wall are correct, click OK.
- To change any of the walls dimensions, enter new values in the Length, Height and Wall thickness fields and click OK.
- If this is the last wall to be drawn click on the Done button.
- To enter the wall again, click the cancel button.
- To prevent this dialog from displaying, hold the Option key down when clicking on the point you want the wall to end.

4. After closing the Edit options dialog, draw the next wall by dragging along one of the constrainer lines displayed:



5. Click at the point you want the wall to end. The Edit options dialog will display again. In this example, the height of the second wall has been increased.

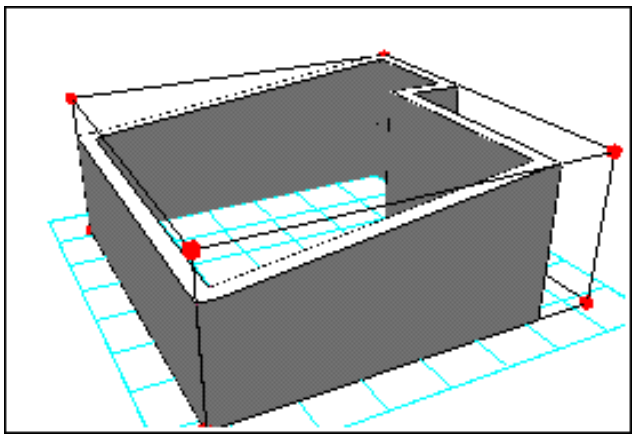



6. Continue drawing further walls in the same way, adjusting the height and thickness of the walls as required.

   While entering walls, if the cursor is aligned with another wall corner, an alignment line will display showing the alignment, and the cursor will change to a hollow cross.

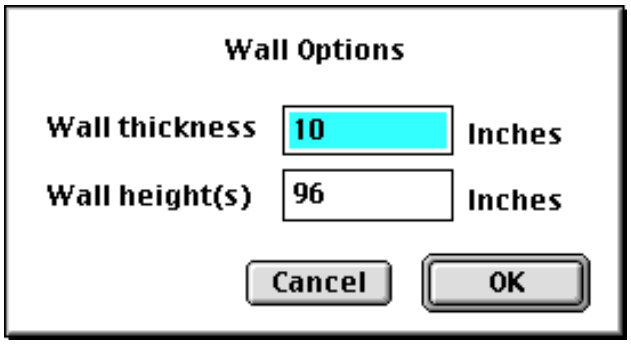
   Press the delete key at any time while entering walls to delete the wall currently being entered. The cursor will be move back to the previously entered wall.

7. When the last wall is drawn, click on the Done button in the Edit options dialog. The view will change back to the previous view and the walls will display as specified. If the walls are the first items drawn, the room will be automatically centred on the grid.



To change the default settings for wall height and thickness for the Walls plug-in:

1. Hold down the Option key and select the Walls tool to display the Wall Options dialog.

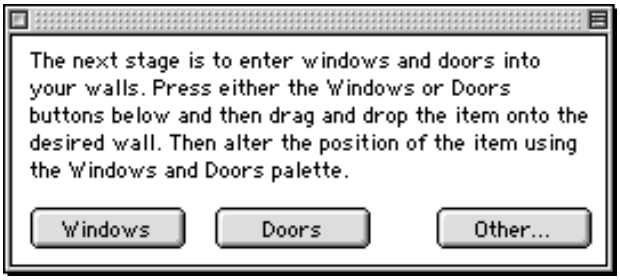



2. Enter a value in the Wall thickness field to specify the default thickness for walls.
3. Enter a value in the Wall height(s) field to specify the default height of the walls.

## ◆ Windows and Doors

The Windows and Doors plug-in allows you to easily access window and door items to place in your document.

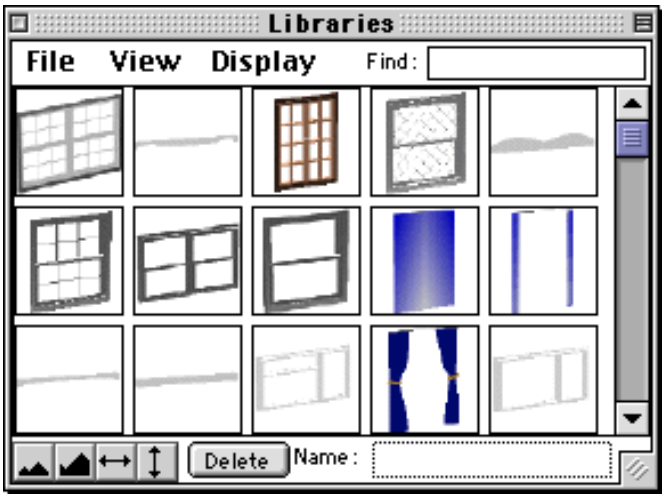
1. Click on the Windows and Doors plug-in icon in the Tools palette. The document window will change to display a view from the middle of the room looking towards the back wall. The Windows and Doors palette will be opened and the Windows and Doors dialog will display:


The next stage is to enter windows and doors into your walls. Press either the Windows or Doors buttons below and then drag and drop the item onto the desired wall. Then alter the position of the item using the Windows and Doors palette.
Windows
Doors
Other...

The NaviCam palette will also display to enable you to easily change the window view. *See NaviCam on page D-72 for more details.*

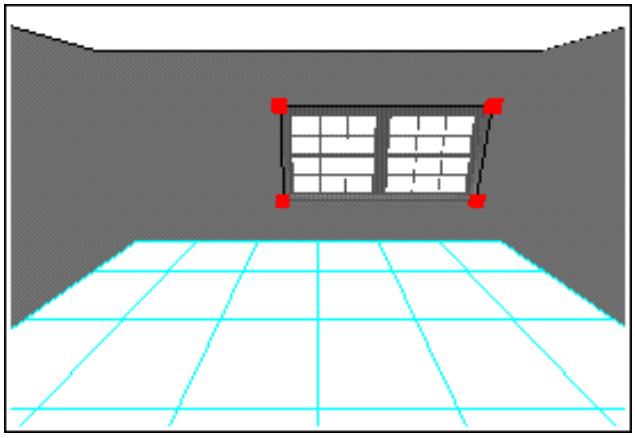
2. Click on one of the buttons in the dialog to access that type of object.

   The Libraries palette is opened and the appropriate library displayed — as long as a library (or an alias) with the specified name is located in the plug-ins folder. *See Libraries on page D-63 for more details.*




   If you click on the button marked ‘Other’ the standard Open File dialog is displayed. You can then select the file to open.

3. Windows and doors can then be dragged out of the library and dropped onto the walls of the room. They can then be resized and positioned as required by dragging the object or by using the Windows and Doors palette. *See Windows and Doors on page D-105 for more details.*



# *Appendix H*

# *Plug-in Modifiers*

Plug-in Modifiers are plug-in tools that are used to modify objects or the scene in some way. When installed they are located in the Tools palette.

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## Introduction

When loaded, plug-in modifiers appear in the Tools palette. The position of each plug-in in the palette will depend on how the user has configured it; the default arrangement is shown below. *See Configuring The Tools Palette on page F-2 for more details.*

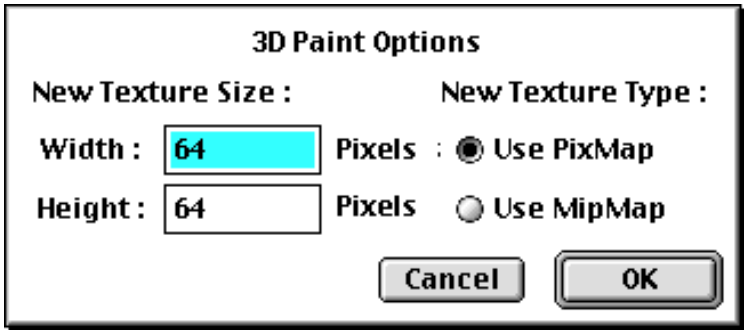
## ◆ 3D Paint

The 3D Paint plug-in is used to paint or modify textures directly onto 3D objects.

### 3D Paint Options

The 3D Paint Options are used to specify a size and type for new textures that will be created when the 3D Paint tool is used on objects that do not already have a texture applied to them.

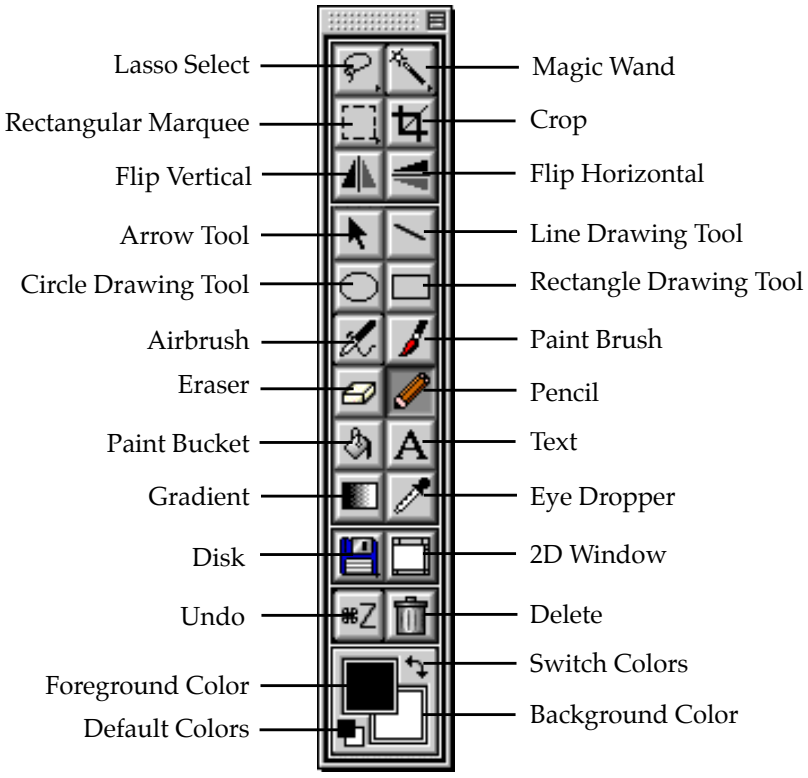
1. Hold down the Option key and click on the 3D Paint tool in the Tool palette to display the 3D Paint Options dialog:




2. Enter values in the Width and Height fields to set the size of new textures in pixels.
3. Click on the Use PixMap or Use MipMap radio buttons to specify the type of new QuickDraw 3D textures that should be applied to objects.

- **Use PixMap:** Pixel Map. This is the standard texture type, and although it can be slower to use PixMap textures rather than MipMap textures, they use less memory. The LightWorks SuperLite renderer is compatible with PixMap textures.
- **Use MipMap:** Multiple In Place Map. This texture type stores lower resolution copies of the main texture to use in different views of an object. This makes it faster to use MipMap rather than PixMap textures, but the MipMap textures require more memory. The Light-Works SuperLite renderer is not currently compatible with MipMap textures.

### 3D Paint Palette




Click on the tool currently selected, or double-click on a tool icon to display any options available for that tool.

### Lasso Select Tool

The Lasso Select tool is used to create selections of any shape by clicking on the surface to be edited and dragging the cursor around to draw the outline of the selection. Click on the Polygonal checkbox in the Lasso Select Options to make a polygonal selection.

To add pixels to a selection, hold down the Shift key and drag around the pixels to be added. To subtract pixels from a selection, hold down the Option key and drag around the area to be eliminated.

### Magic Wand Tool

The Magic Wand tool is used to select adjacent pixels of similar color or brightness.

Use the Tolerance slide bar in the Magic Wand Options dialog to adjust the tool's tolerance:

- **Tolerance = 0%:** the Magic Wand will only select adjacent pixels with the exact same color or brightness.
- **Tolerance = 100%:** the Magic Wand will select all adjacent pixels regardless of their color or brightness.

By default, the Magic Wand tool will select adjacent pixels of similar color. To select adjacent pixels of similar brightness, click the Light radio button.

Click anywhere on the surface to be edited. The Magic Wand tool will automatically select adjacent pixels of similar color or brightness according to your settings.

To add pixels to a selection, hold down the Shift key and click on the desired area. To subtract pixels from a selection, hold down the Option key and click on the area to be eliminated.

### Rectangular Marquee Tool

The Rectangular Marquee tool is used to make rectangular selections.

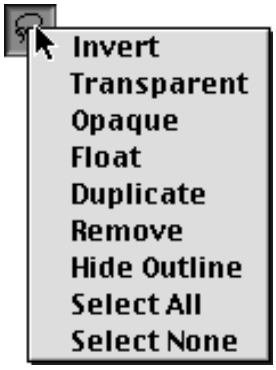
Select the tool, click on the surface and drag out a rectangular selection.

To add pixels to a selection, hold down the Shift key and make an further selection. To subtract pixels from a selection, hold down the Option key and drag around the area to be eliminated.

#### Selection Tool Popup Menu

All of the selection tools, (Lasso Select, Magic Wand and Rectangular Marquee) produce selections that also act as a mask.

The same Selection popup menu is available for each selection tool, and is accessed by clicking on the tool and holding down the mouse button:




- **Invert:** Selects the portion of the texture that is currently not selected, and deselects the original selection.
- **Transparent:** Makes the selected area of the texture transparent.
- **Opaque:** Makes any transparent portions of the selected area opaque.
- **Float:** Duplicates the selected pixels and places them in a floating selection. This allows you to duplicate a selected portion of the texture so that it can be retouched and moved without altering the original image.
- **Duplicate:** Pastes a copy of the selected pixels into the texture in the current position, and leaves a copy of the pixels in a floating selection.
- **Remove:** Removes a floating selection from the texture or, if there is not a floating selection, deselects all areas currently selected.
- **Hide Outline:** Hides the selection outline, making it easier to precisely retouch the selection's borders and to see modifications.
- **Select All:** Selects the entire texture (Command-A).
- **Select None:** Deselects all areas currently selected (Command-D).

**Crop Tool**

The Crop tool is used to remove unwanted parts of a texture.

Select the Crop tool, then click and drag an outline around the area you want to keep. The texture will be reduced to contain only those pixels inside the crop outline.

**Flip Vertical**

Flips the texture around the vertical axis.

**Flip Horizontal**

Flips the texture around the horizontal axis.

**Arrow Tool**

The Arrow tool is used to select the surface of the 3D object that is to be edited, and also to rotate the object.

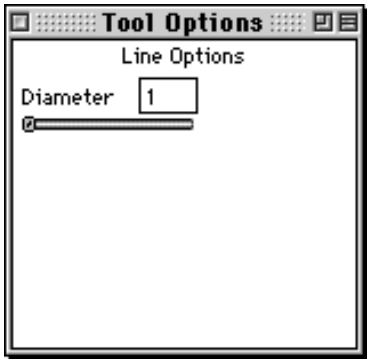
Select the Arrow tool and click on the surface of the 3D object you wish to edit. The selected surface will display in the 2D Editing window if it is open. *See Window on page H-16 for more details.*

When a surface of the object is selected using the Arrow tool, the object displays with a bounding sphere and rotation handles. Click on a handle and drag to rotate the object so that other surfaces can be seen.

**Line Drawing Tool**

The Line Drawing Tool is used to draw straight lines.

Set the line thickness in pixels by entering a value in the Diameter field, or adjusting the slider bar, in the Line Options dialog:



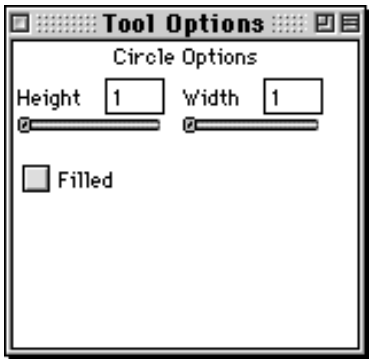

Click on the object's surface and drag to draw a straight line.

Hold down the Shift key to draw a vertical or horizontal line or a line at a 45° angle.

**Circle Drawing Tool**

The Circle Drawing Tool is used to draw empty or filled circles and ovals.

Set the pen dimensions in pixels by entering values in the Height and Width fields, or adjusting the slider bars, in the Circle Options dialog:




Click on the object's surface and drag to draw an oval.

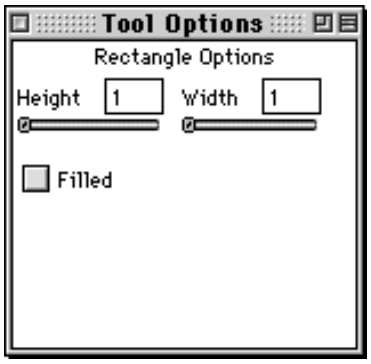
Hold down the Shift key to constrain the oval to a circle.

Click on the Filled checkbox to draw an oval or circle filled with the foreground color.

### Rectangle Drawing Tool

The Rectangle Drawing Tool is used to draw empty or filled squares and rectangles.

Set the pen dimensions in pixels by entering values in the Height and Width fields, or adjusting the slider bars, in the Rectangle Options dialog:




Click on the object's surface and drag to draw a rectangle.

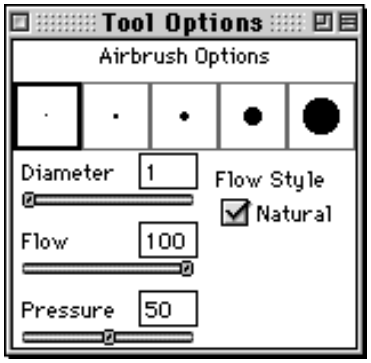
Hold down the Shift key to constrain the rectangle to a square.

Click on the Filled checkbox to draw an rectangle or square filled with the foreground color.

### Airbrush

The Airbrush tool is used to spray a fine-grained paint onto the image.

Use the settings in the Airbrush Options dialog to configure the Airbrush tool.



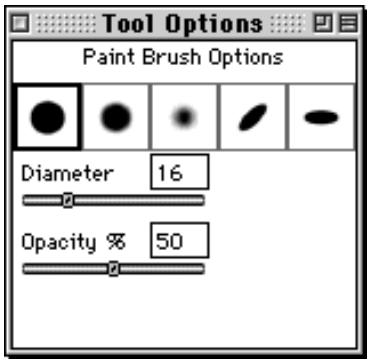
- **Diameter:** Set the Airbrush's width by choosing a brush size from the selection at the top of the dialog, or enter a value in the Diameter field or use the slider bar to define a new brush size.
- **Flow Style:** Choose a paint flow style by checking or unchecking the Natural checkbox. If Natural Flow Style is checked, paint is sprayed as you click the mouse and the faster the mouse is moved, the lighter the paint flows. If Natural Flow Style is unchecked, paint is sprayed in equal thickness on all areas, regardless of the speed of the mouse.
- **Flow:** Set the flow speed by entering a value in the Flow field or adjusting the slider bar. The Flow setting is only relevant if Natural Flow Style is checked, and only affects the Airbrush tool when the cursor is not moving.
- **Pressure:** Set the strength of the paint flow by entering a value in the Pressure field or adjusting the slider bar.

When the airbrush is configured, click on a surface to begin painting.

### Paint Brush

The Paint Brush tool is used to paint with brushes of various shapes and widths.

Use the settings in the Paint Brush Options dialog to configure the Paint Brush tool.



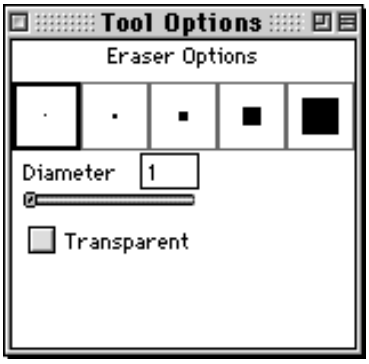

- **Shape:** Choose a brush shape and style to use from the selection at the top of the dialog.
- **Diameter:** Set the paint brush's width by entering a value in the Diameter field or adjusting the slider bar.
- **Opacity:** Set the opacity of the paint by entering a value in the Opacity % field or adjusting the slider bar.

When the paint brush is configured, click on a surface to begin painting.

### Eraser

The Eraser tool is used to remove parts of a texture and replace them with the background color or a transparent area.

Use the settings in the Eraser Options dialog to configure the Eraser tool.



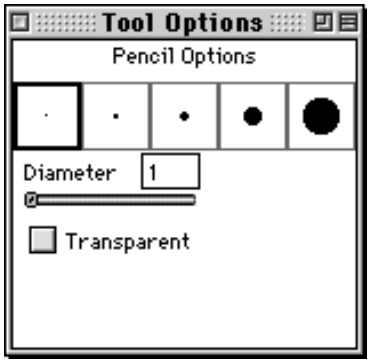

- **Diameter:** Set the Eraser's width by choosing a size from the selection at the top of the dialog, or enter a value in the Diameter field or use the slider bar to define a new size.
- **Transparent:** Check the Transparent checkbox to erase and replace with a transparent area, or leave Transparent unchecked to erase and replace with the background color.

When the eraser is configured, click on a surface to begin removing pixels.

### Pencil

The Pencil tool is used to draw dots, curves and lines either with the foreground color or in transparent mode.

Use the settings in the Pencil Options dialog to configure the Pencil tool.




- **Diameter:** Set the Pencil's width by choosing a size from the selection at the top of the dialog, or enter a value in the Diameter field or use the slider bar to define a new size.
- **Transparent:** Check the Transparent checkbox to draw in transparent mode, or leave Transparent unchecked to draw using the foreground color.

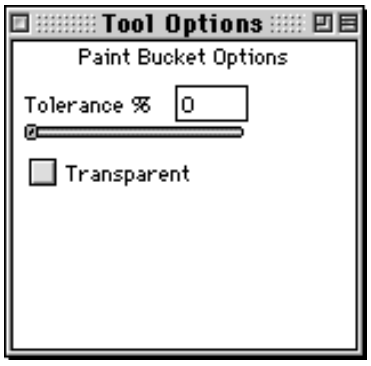
To draw straight horizontal or vertical lines, hold down the Shift key while drawing.

When the pencil is configured, click on a surface to begin drawing.

### Paint Bucket

The Paint Bucket tool is used to fill adjacent pixels of similar color with the foreground color or a transparent area.

Use the settings in the Paint Bucket Options dialog to configure the Paint Bucket tool.



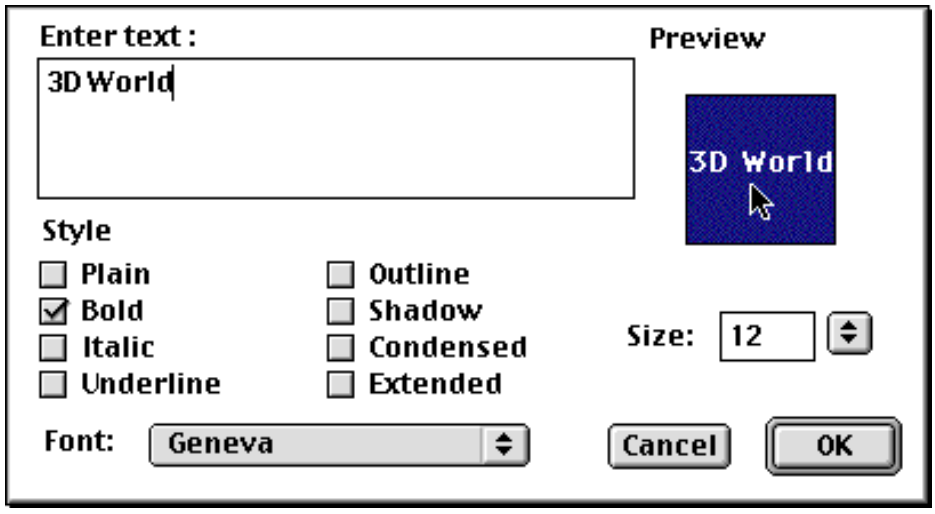
- **Tolerance:** Enter a value in the Tolerance % field or adjust the slider bar to adjust the Paint Bucket's tolerance. If Tolerance = 0%, the Paint Bucket tool will fill only adjacent pixels that have exactly the same color. If Tolerance = 100%: the Paint Bucket tool will fill all adjacent pixels regardless of their color.
- **Transparent:** Check the Transparent checkbox to fill with a transparent area, or leave Transparent unchecked to fill using the foreground color.

When the Paint Bucket tool is configured, click on the surface to fill all adjacent pixels of similar color.

### Text

The Text tool is used to add text to a texture.

Select the Text tool and click on the surface to be edited. The Text dialog will display:




- **Enter text:** Type in the text to be added to the texture.
- **Font:** Choose a font from the font popup menu.
- **Style:** Click on any of the Style checkboxes to apply styles to your text.
- **Size:** Choose a font size from the Size popup menu or enter a value in the Size field.
- **Preview:** The text will be drawn using the current foreground color and will display in the Preview area. Click on the text in the Preview and drag to place it in the correct position.

When finished, click OK to place your text.

### Gradient

The Gradient tool is used to apply graduated colors to the area or a selection.

1. Set the foreground and background colors. *See Foreground/Background Colors on page H-18 for more details.*
2. Click on the surface and drag to draw a line. Release the mouse button at the point the line is to end. Hold down the Shift key to constrain the line to horizontal or vertical.
3. A gradient is applied to the surface or selection. The foreground color is used at the point where the start of the line was drawn, blending to the background color at the point the end of the line was drawn.

### Eye Dropper

The Eye Dropper tool is used to pick up colors from a texture.

1. Click on the Eye Dropper tool, then on the texture.
2. The color of the pixel clicked on will be picked up and displayed as the foreground color at the bottom of the 3D Paint palette.
3. This color can now be applied to the texture using any of the drawing or painting tools.

**Note:** Hold down the Option key with any drawing or painting tool selected, and the tool will be changed to the Eye Dropper tool.

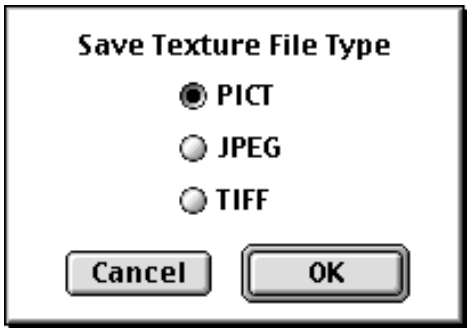
### Disk

The Disk option is used to load textures from, or save textures to, disk.

Click on the Disk icon and hold down the mouse button to display the following menu:

- **Load Texture:** Select Load Texture and a standard dialog displays for you to locate and select a texture. Once chosen, the texture is applied to the object surface currently selected.

- **Save Texture:** Select Save Texture and a dialog displays for you to select the file format to save the texture in:

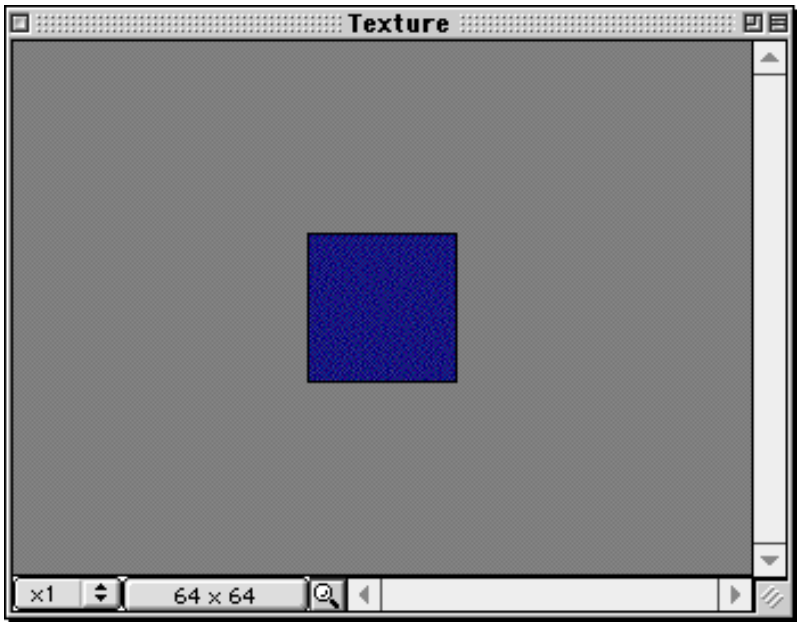



  Choose the file type and click OK. A standard dialog displays for you to choose the file name and location to save the texture.

  The texture on the currently selected surface will be saved as you have specified.

## Window

Use the Window command to display the Texture window that displays the current surface texture in 2D.



Editing the texture in 2D in the Texture window will be faster than editing textures in 3D in the 3D World document window.

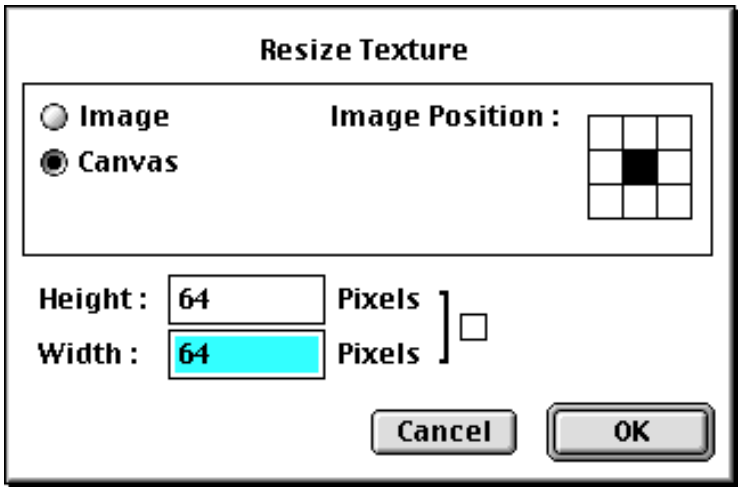
The toolbar at the bottom of the Texture window provides the following controls:

#### View Scale

Click in the bottom left corner of the window to display the View Scale popup menu. Select the scale at which to view the texture:

#### Resize Texture

The button next to the View Scale menu displays the size of the texture in pixels. Click on this button to display the Resize Texture dialog, which allows you to change the size of the image or canvas:




- **Image:** Click on the Image radio button to resize the existing texture.
- **Canvas:** Click on the Canvas radio button to increase the size of the texture area without changing the size of the existing texture. This allows you to add more space around the existing texture.

- **Image Position:** When Canvas is selected, position the existing texture on the new texture area by clicking on one of the squares in the area representing the canvas.
- **Dimensions:** Enter values in pixels in the Height and Width fields to set the new size of the image or canvas.
- **Constrain:** Check the constrain checkbox to maintain the proportions of the image or canvas.

Click OK to resize the image or canvas.

#### Zoom Tool

The Zoom tool on the window toolbar is used to zoom in or out of the image.

Select the Zoom tool and click in the window to zoom in. Hold down the Option key and click in the window to zoom out.

#### Undo

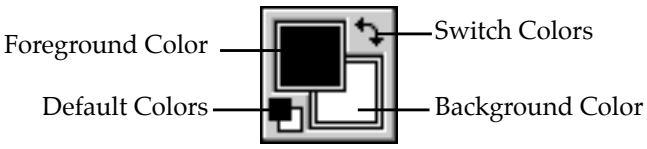
Use the Undo command to undo your last action only.

#### Trash

Use the Trash command to delete the texture or a selection of it.

#### Foreground/Background Colors

The current foreground and background colors are displayed at the bottom of the 3D Paint palette:




Click on the foreground or background color box to bring up the color picker and select a different color, or drag and drop a color onto the color box. Colors can also be dragged out of the foreground and background color boxes.

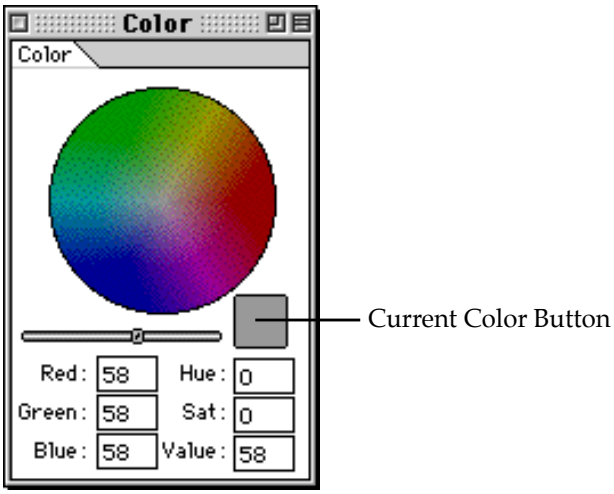
To switch the foreground and background colors over, click on the switch colors arrows.

To set the foreground color to black and the background color to white, click on the default color icon.

### 3D Paint Color Palette

The 3D Paint Color palette is used to easily select a new foreground color. It is included with the 3D Paint plug-in and will be loaded with it.

Select Color from the Palette menu to display the 3D Paint Color palette:




Choose a color from the Color palette by clicking on the color wheel and/or adjusting the brightness slider bar and values for Red, Green, Blue, Hue, Saturation and Value.

Click on the current color button to display the system color picker(s).

**Note:** Colors can be dragged to and from the current color button.

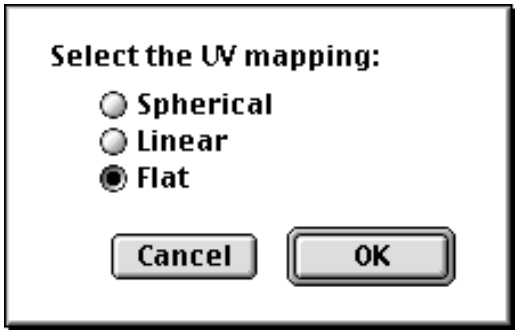
**Note:** The 3D Paint Color Palette can be used when not using the 3D paint plug-in. It is used in the same way as the Picker palette. *See Picker on page D-75 for more details.*

## ◆ Add UV

The Add UV plug-in prepares an object to accept a texture, when it would not otherwise be able to have a texture mapped onto it, or changes the way that a texture is mapped on an object.

- **To add 'texture handles' to an object, or change the way that textures are mapped on an object:** Select the Add UV tool from the Tool palette and move the cursor over the document window. The cursor will change to a hand with a plus sign on it. Click on the object you wish to be able to add a texture to or change the texture mapping on.
- **To remove the 'texture handles' from an object:** Select the Add UV tool again. Hold down the Option key and move the cursor over the document window. The cursor will change to a hand with a minus sign on it. Click on the object to remove the texture handles.

Hold down the Option key and click on the Add UV tool to display the Add UV options:




- **Spherical:** If spherical mapping is selected, a texture applied to a convex object will be mapped in the same way as a world map is placed on a sphere. For concave objects, the texture will be mapped as if the object were carved out of a sphere.
- **Linear:** If linear mapping is selected, a texture applied to an object will be mapped in the same way as the lettering in a stick of rock.
- **Flat:** If flat mapping is selected, a texture applied to an object will be mapped on each surface in the same way as a flat surface is mapped.

### The Add UV Menu Command Plug-in

Make a selection in the document window and choose Add UV from the Plug-in menu. The selected object(s) will now be able to accept textures. To display the Add UV options, hold down the Option key and select the Add UV menu item.

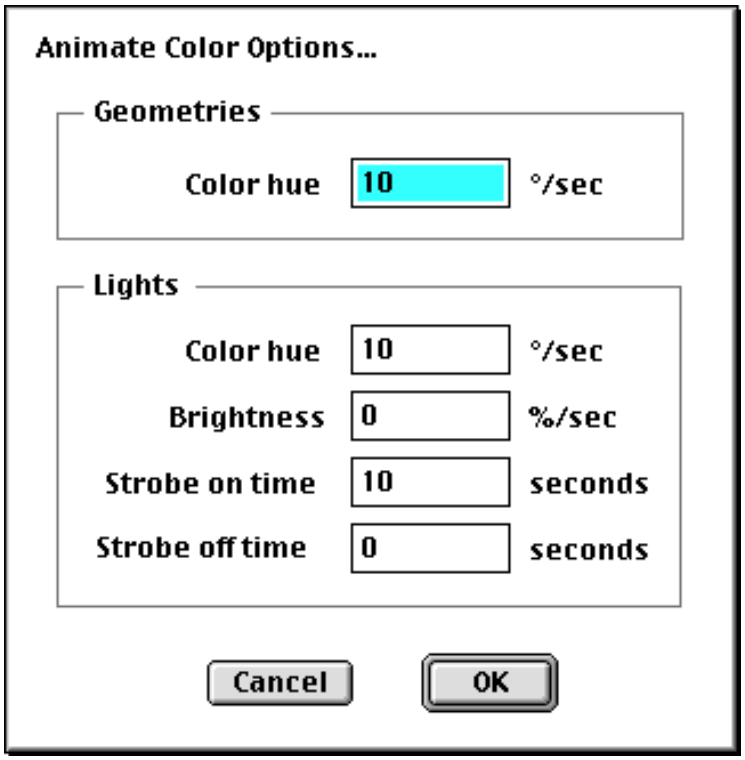
## ◆ Animate Color

The Animate Color plug-in allows you to animate the color of an item or group of items. The color is animated by displaying the colors around the color wheel at the same distance from the center of the color wheel as the original color. If the original color of the item was black, gray or white (all in the center of the color wheel), using the Animate Color tool will not produce any changes in color.

**Note:** Animation must be turned on for the document for you to see the results of using the Animate Color tool. *See Animation On on page 3-41 for more details.*

- **To animate the color of an object:** Select the Animate Color tool from the Tool palette. As the cursor is moved over the document window it will change to an oval with arrows around it and a plus sign in the center. Click on an object, light or group in the document window and the assigned color of the item will change over time.
- **To stop the animation of an object's color:** Select the Animate Color tool and hold down the Option key. As the cursor is moved over the document window it will change to an oval with arrows around it and a minus sign in the center. Click on an object, light or group in the document window to stop the color from animating.

To set the Animate Color Options, hold down the Option key and select the Animate Color tool. The Animate Color Options dialog displays:




- **Geometries:** When animating the color of an object, enter a value in the Color hue field in the Geometries section at the top of the dialog. This specifies the number of degrees around the color wheel to move each second to select the colors to apply to an object.
- **Lights:** When animating lights, the Lights section has fields for Color hue, Brightness, Strobe on time and Strobe off time.

  Color hue: The Color hue value entered specifies the number of degrees around the color wheel to move each second to select the colors to apply to a light.

  Brightness: Enter a value between 0 and 100 to specify the percentage change in brightness of the light per second. This value is a percentage of the brightness originally set for the light in the Info Palette. *See Brightness on page 4-22 for more details.* Each second the brightness of the light will change by the set percentage, cycling round to get darker, brighter and darker again.

  Strobe on time: Enter a value in seconds for the length of time the light should stay on when it is to flash on and off.

Strobe off time: Enter a value in seconds for the length of time the light should stay off when it is to flash on and off.

Click OK to enter the options. They will remain as set until changed.

#### The Animate Color Menu Command Plug-in

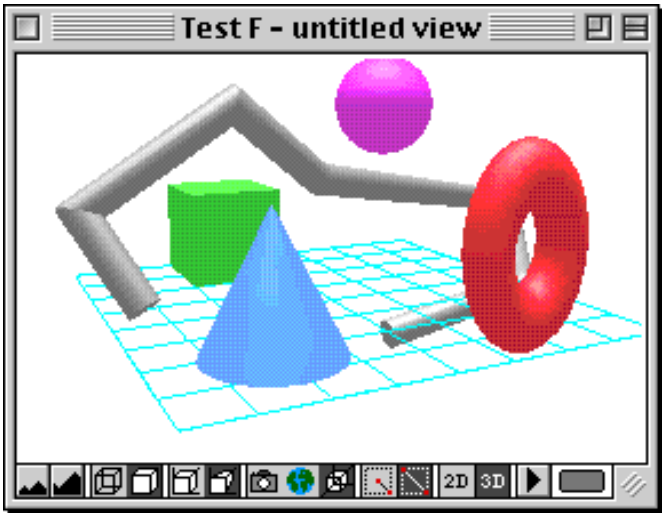
Make a selection in the document window and choose Animate Color from the Plug-in menu. The color of the selected object(s) will be animated. To display the Animate Color options, hold down the Option key and select the Animate Color menu item.

## ◆ Animate Object

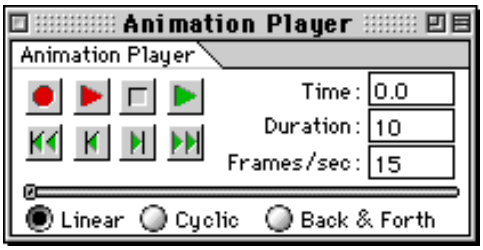
The Animate Object plug-in is used to move a selected object along a specified path over a set time.

To use the Animate Object plug-in you will require the Animation Tweener plug-in to be loaded. The Animation Player and Pipes plug-ins will also be useful.

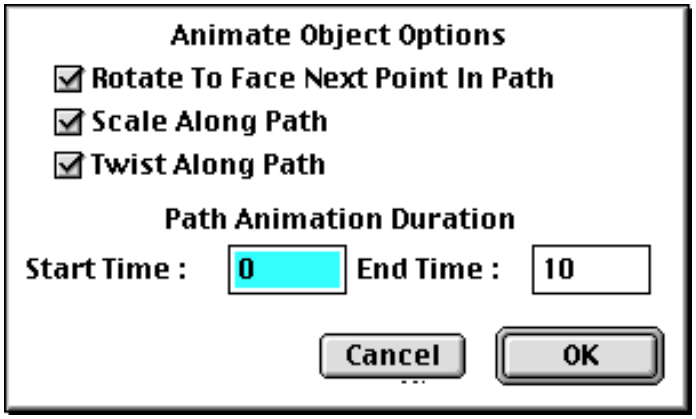
1. Define a path for the object to be animated along. The screen shot below shows a path created by using the Pipes plug-in. *See Pipes on page G-43 for more details.*



2. Set up the Animation Player palette according to your requirements for the movie you wish to record. *See Animation Player on page D-12 for more details.*

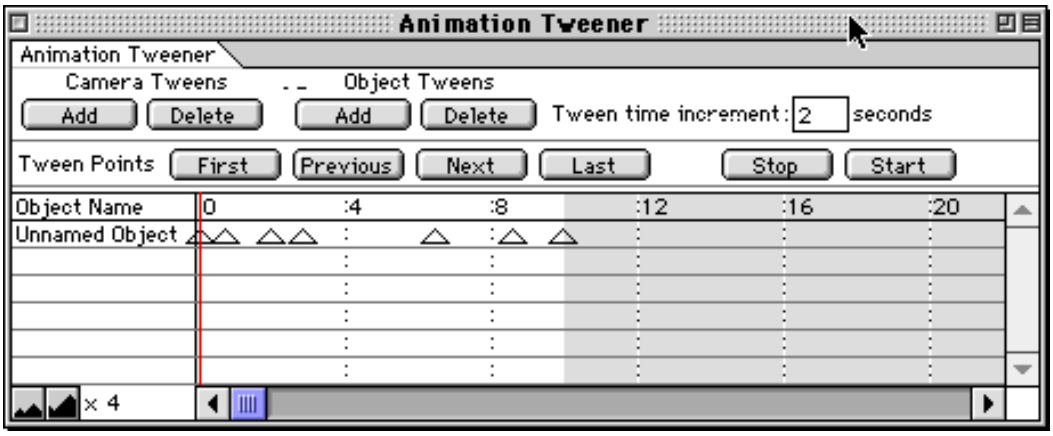



3. Position the object to be animated in the correct orientation in relation to the path it will be animated along.
4. To change the default settings for the Animate Object plug-in, hold down the Option key and select the Animate Object plug-in from the Tools palette. The Animate Object Options dialog displays:




5. Click on any or all of the check boxes to specify how the object should move along the path:
   - **Rotate To Face Next Point In Path:** The object is rotated as it moves along the path so that it maintains its original orientation in relation to the path.
   - **Scale Along Path:** If the path section has been scaled at any point using the Edit Path plug-in, the object will also be scaled in proportion to the path. *See Edit Path on page H-34 for more details.*
   - **Twist Along Path:** If the path section has been rotated at any point using the Edit Path plug-in, the object will also be rotated as it moves along the path. *See Edit Path on page H-34 for more details.*

6. Enter values in the Start Time and End Time fields to specify when this particular path animation should start and finish. The maximum time for the path animation is determined by the duration for the animation as set in the Animation Player palette. Multiple object animations can be saved for different time periods and/or different objects in the same animation.
7. Select the path object in the 3D World document and choose Animate Object from the Tools Palette.
8. Click on the object to be animated. Object Tweens will be saved and displayed in the Animation Tweener palette. The object drawn to define the path can then be deleted or moved to another layer and hidden. *See Animation Tweener on page D-17 for more details.*




**Note:** The animated object is not linked to the path in any way. If the path is edited, the animation for the object will not be changed. The object must be animated along the new path for the animation to be updated.

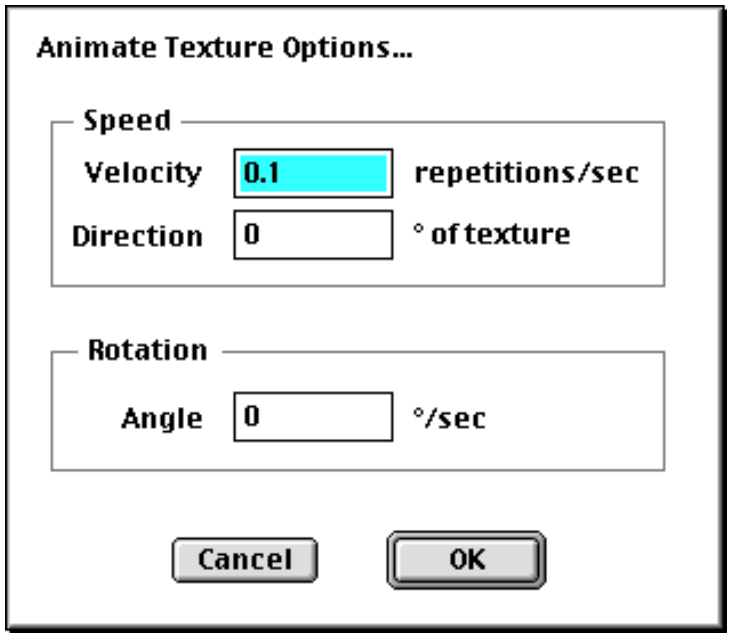
## Animate Textures

The Animate Textures plug-in is used to animate the texture applied to an object.

**Note:** Animation must be turned on for the document for you to see the results of using the Animate Textures tool. *See Animation On on page 3-41 for more details.*

- **To animate the texture on an object:** Select the Animate Textures tool from the Tool palette. As the cursor is moved over the document window it will change to an oval with arrows around it and a plus sign inside. Click on an object with a texture applied to it and the texture will start to move over the object.
- **To stop an object's texture from animating:** Select the Animate Texture tool and hold down the Option key. As the cursor is moved over the document window it will change to an oval with arrows around it and a minus sign inside. Click on the object with a moving texture to remove the animation.

To set the Animate Texture options, hold down the Option key and select the Animate Texture tool. The Animate Texture Options dialog will display:




- **Velocity:** Enter a figure in the Velocity field to specify how many times the applied texture should move around the object per second. The default value is 0.1.
- **Direction:** The default value for direction is 0°. The texture will then move from right to left over the surface of the object. To change the direction, enter a value between 0 and 360 in the Direction field. Set at 90° the texture will move from top to bottom, 180° from left to right, 270° from bottom to top, and so on.
- **Rotation:** Enter a value between 0 and 360 in this field if you wish the texture to rotate as it moves over the object. Each second the texture will be rotated by the specified value. The default value is 0°.

Click OK to enter the options. They will remain as set until changed.

#### The Animate Textures Menu Command Plug-in

Make a selection in the document window and choose Animate Textures from the Plug-in menu. The textures on the selected object(s) will be animated. To display the Animate Textures options, hold down the Option key and select the Animate Textures menu item.

## ◆ Bomb

The Bomb plug-in blows up and deletes selected objects.

Select the Bomb tool from the Tool palette. As the cursor is moved over the document window it will change to a bomb icon. Click on an object and it will explode and be deleted from the document. Alternatively, select the Bomb tool then press the delete key. Any selected objects will explode and be deleted.

#### The Bomb Menu Command Plug-in

Select the item(s) you want to delete (ungroup them if you are not running QuickDraw 3D 1.5 or later), then select Bomb from the Plug-in menu. The selected items will explode and be deleted.

## ◆ Color

The Color plug-in is used to change the color of objects by simply clicking on them.

Select the Color tool from the Tool palette. As the cursor is moved over the document window it will change to a hand. Click on an object and the default color, displayed at the bottom of the document window, will be applied to it. If the object had a texture applied to it, the texture will be replaced by the color.

### The Color Menu Command Plug-in

Make a selection in the document window and choose Color from the Plug-in menu. The color of the selected object(s) will be changed to the default color displayed at the bottom of the document window.

## ◆ Construct

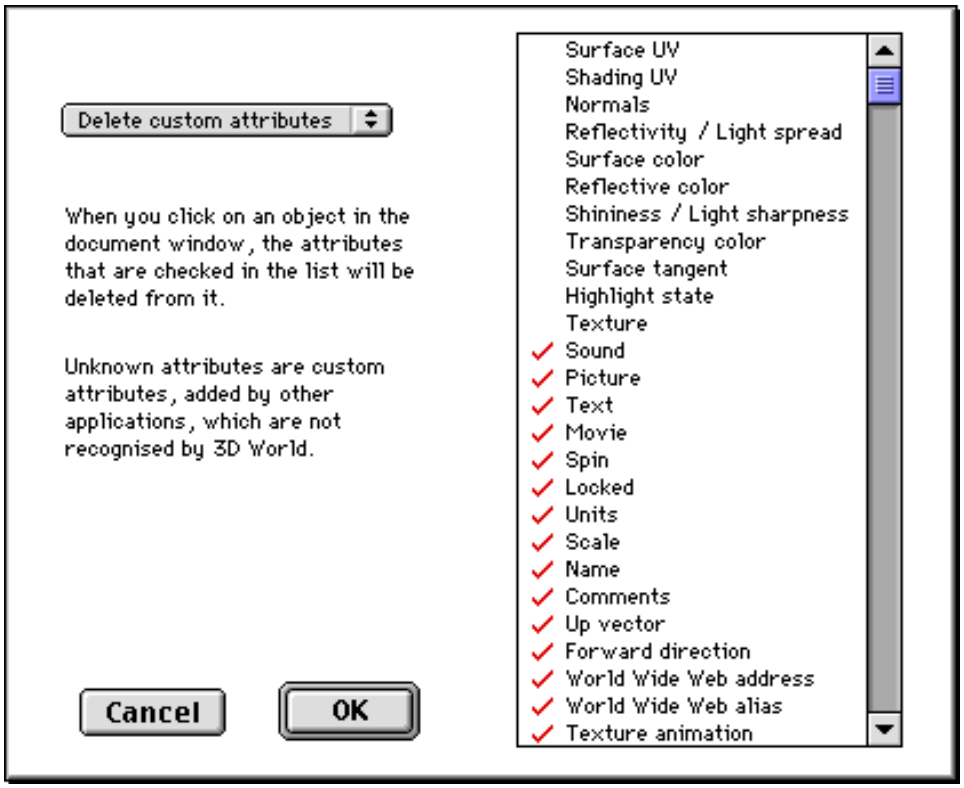
Construct is both a plug-in modifier and a plug-in palette. *See Construct on page D-33 for more details.*

## ◆ Delete Attributes

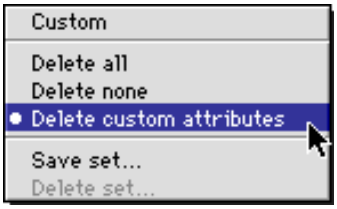
Use the Delete Attributes plug-in to delete attributes that have been applied to an object.

Select the Delete Attributes tool from the Tool palette. As the cursor is moved over the document window it changes to a pointing hand with a minus sign in it. Click on an object to delete its attributes according to the settings in the Delete Attributes Options dialog.

To set the options for the Delete Attributes tool, hold down the Option key and select the Delete Attributes icon in the Tool palette. The Delete Attributes Options dialog displays:




Click on the popup menu to display the attribute set options:




- **Custom:** Select to create a custom set. Select Custom in the popup menu then check or uncheck attributes in the list by clicking next to the attribute name. A custom set can also be created by checking or unchecking attributes in the list when Delete custom attributes, Delete all or Delete none is selected. In this case the set selected will automatically change to Custom.

- **Delete custom attributes:** Select to delete all custom attributes from an object. This is the default setting. Custom attributes are those not defined by QuickDraw 3D and appear below Texture in the attribute list.
- **Delete all:** Select to delete all the attributes applied to an object.
- **Delete none:** Select to delete none of the attributes applied to an object.
- **Save set:** After creating a custom set, it can be saved and added to the popup menu. Create the set and select Save set from the popup menu. In the dialog that displays, enter a name for the custom set and click Save. The new set is added to the popup list.
- **Delete set:** User defined sets can also be deleted. Select Delete set from the popup menu. A dialog will display a list of sets that can be deleted. Select the name of the set to delete in the list and click delete. The set will be deleted and removed from the popup menu.

Click OK to enter the options. They will remain as set until changed.

#### The Delete Attributes Menu Command Plug-in

Make a selection in the document window and choose Delete Attributes from the Plug-in menu. The attributes of the selected objects will be deleted according to the options set for the Delete Attributes tool. To display the Delete Attributes Options dialog, hold down the Option key and select the Delete Attributes menu item.

## ◆ Distance

The Distance plug-in is used to measure the distance between two points.

The measurements calculated by the Distance tool are displayed in the Help palette. If the Help palette is not already open, select Help from the Palette menu to display it.

Select the Distance tool from the Tool palette. As the cursor is moved over the document window it displays as a cross. Click on an object or the grid, then click on another object or the grid. The distance between the two points will be displayed in the Help palette.

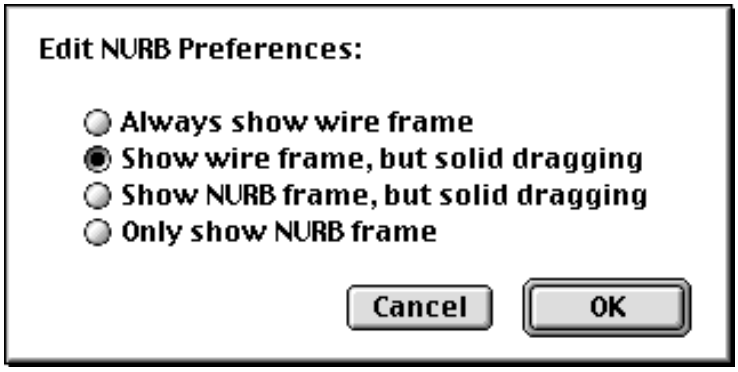
If a Snapping grid distance has been set, the distance tool will snap to the nearest Snapping grid point, and the distance reported will reflect this *See Grid Options on page 3-38 for more details.*

## ◆ Edit NURB

The Edit NURB plug-in is used to edit objects by manipulating their NURB control points.

Only objects drawn using NURBs can be edited using the Edit NURB tool. The Subdivision palette is used to specify what sort of internal geometries (polygons and trigrids, conic primitives or NURBs), 3D World will use to draw geometries. *See Subdivision on page D-96 for more details.*

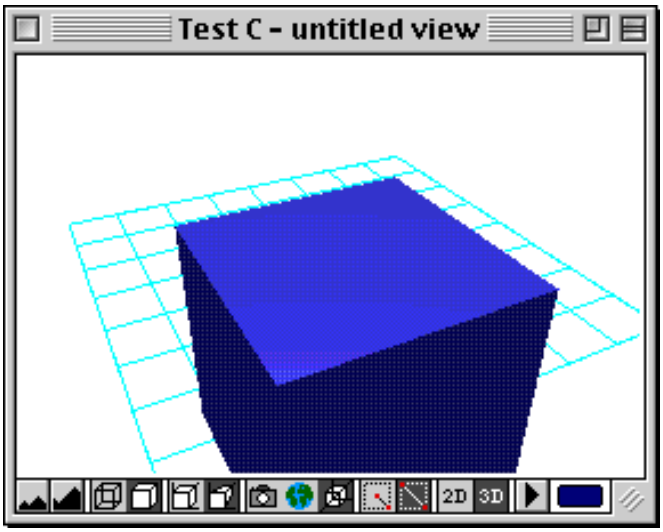
1. Select the Edit NURB tool from the Tool palette.
2. To specify how the objects being edited should display, hold down the Option key and click on the Edit NURB tool again to display the Edit NURB Preferences dialog:



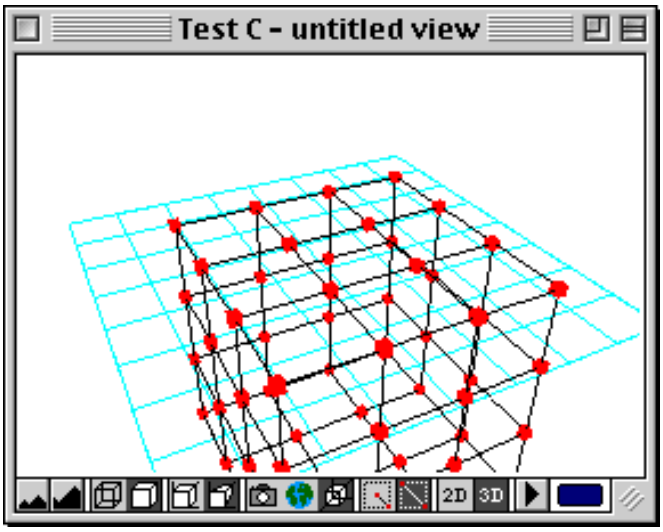

Check one of the radio buttons to set your display preference.

- **Always show wire frame:** The object displays in wire frame with the NURB frame and NURB handles, when the object is selected and when it is in the process of being edited.
- **Show wire frame, but solid dragging:** The object displays in wire frame with the NURB frame and NURB handles when the object is selected, but as a solid object when it is in the process of being edited.
- **Show NURB frame, but solid dragging:** The NURB frame and NURB handles of the object display when it is selected, but the object displays as a solid object when it is in the process of being edited.
- **Only show NURB frame:** The object's NURB frame and NURB handles display when it is selected and when it is in the process of being edited.

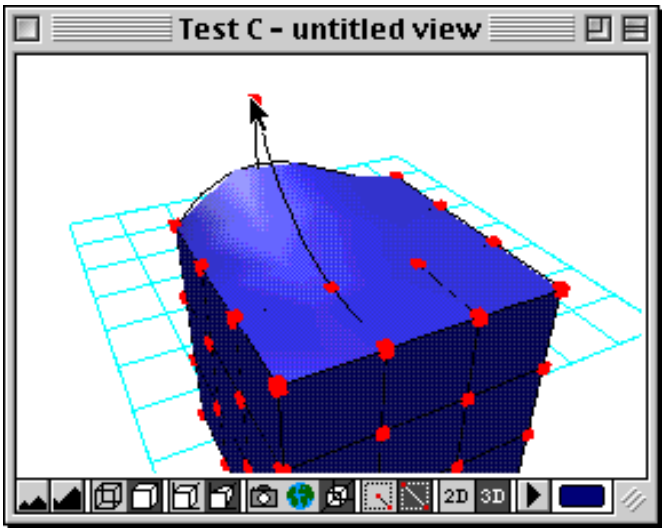
3. Click on an object in the document window that has been drawn using NURBs (*see above*).



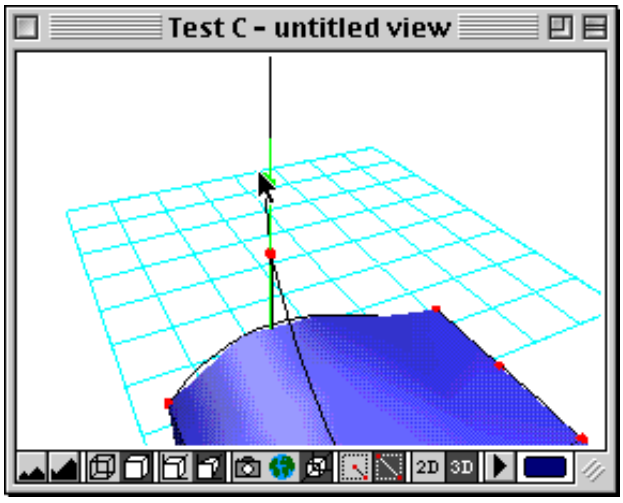

4. The object will display as specified in the Edit NURB Preferences dialog. The number of NURB control points on an object is determined by the object geometry and is constant for that specific geometry.

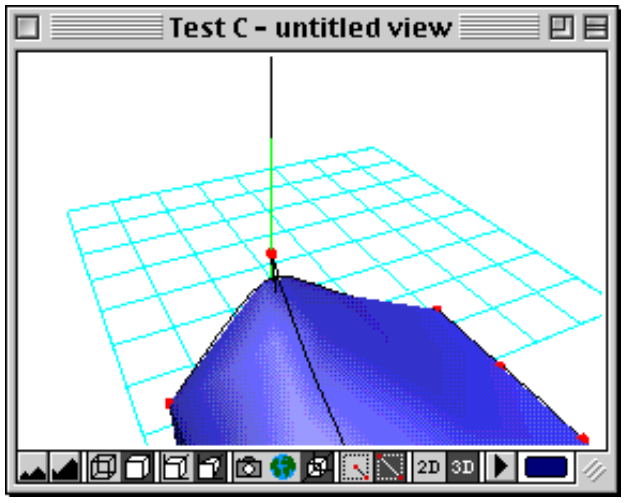


5. Click on a NURB control point and, holding down the mouse button, drag to move the point and modify the object's shape. Only one point at a time can be selected and edited.




6. Hold down the Option key and click on a NURB control point to pull out weighting handles for that point. Click and drag on the weighting handles to adjust the pull the NURB control point exerts on the object and further manipulate its shape.



## Edit Path

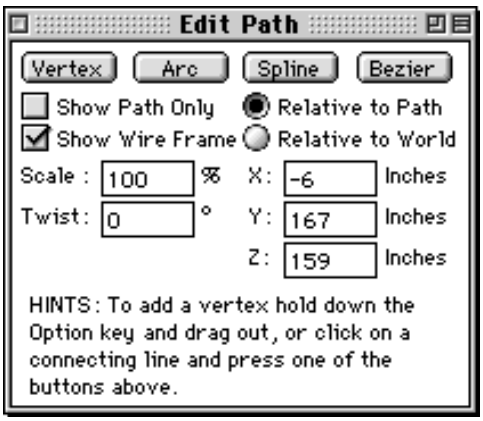
The Edit Path plug-in is used to edit the path of a geometry and can also be used to scale and rotate the section of a geometry at specific points on its path.

The path of any geometry that is defined as a section and path can be edited, that is, 3D Text, cone, cylinder, extruded bitmap, irregular polygon, pipe, pyramid, and regular polygon. The paths of lathed objects can also be edited, but this is done in a slightly different way from other geometries. *See Editing the Path of a Lathed Object on page H-43 for more details.*

The position of an object's path can be changed relative to its section by repositioning the object's origin via controls in the Section palette. This will alter the effects of using the Edit Path tool to scale and rotate the section of a geometry. *See Changing the Object's Origin on page D-95 for more details.*

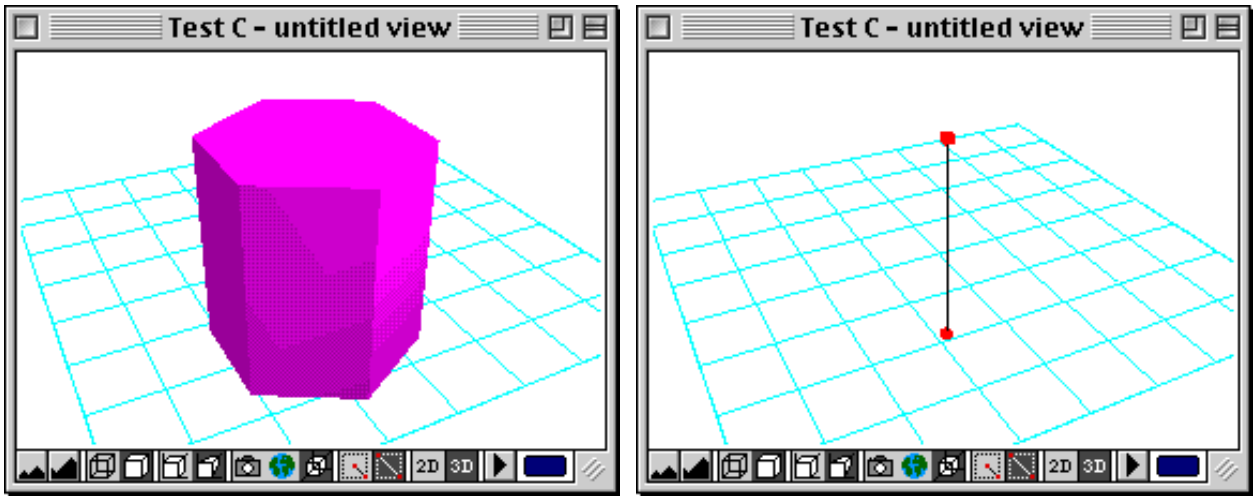
### The Edit Path Dialog

To display the Edit Path dialog, click on the Edit Path tool in the Tool palette.


Edit Path
Vertex
Arc
Spline
Bezier
Show Path Only
Show Wire Frame
Relative to Path
Relative to World
Scale : 100 %
Twist : 0 °
X: -6 Inches
Y: 167 Inches
Z: 159 Inches
HINTS: To add a vertex hold down the Option key and drag out, or click on a connecting line and press one of the buttons above.

### Displaying The Object Path

With the Edit Path tool selected, click on an object in the document window. The selected object will be hidden, but its path will display as a black line with handles at the ends and on the curves.




### Types Of Point

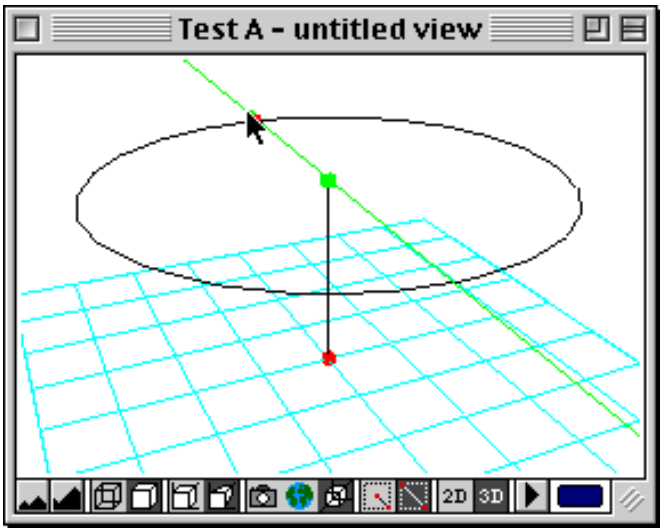
- **Vertex:** A standard point used to define the beginning or end of a straight section of a path or line.
- **Arc:** A point on a section of a circle defined as the center point on the arc between two vertex points.
- **Spline:** A point on a curve. The curve is defined automatically and cannot be edited except by adjusting the points at either side of the spline point.
- **Bezier:** A point on a curve. Two Bezier handles allow the curve to be adjusted.

Vertex point handles display as squares, Bezier and spline point handles as diamonds, and arc point handles as spheres.

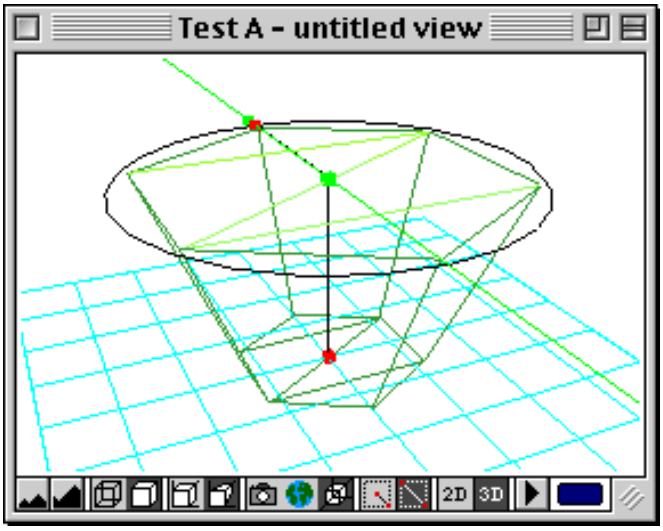
### Viewing Manipulations

The Show Path Only and Show Wire Frame radio buttons allow you to determine how you will see your object when selected with the Edit Path tool and as it is manipulated.

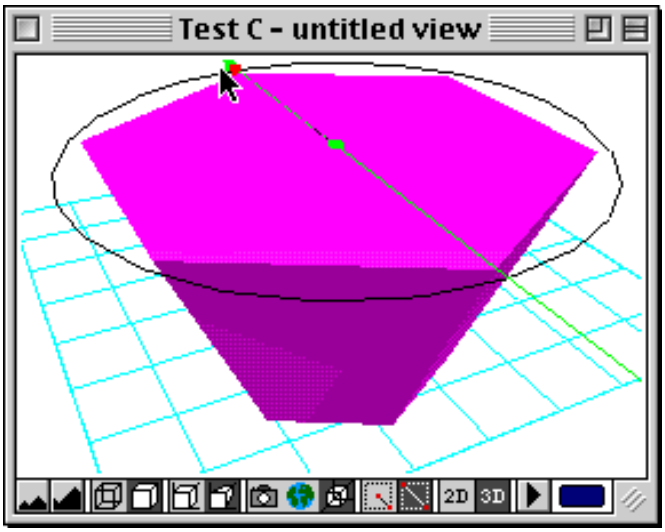
- **Show Path Only:** If this option is chosen, only the object path will display, both when the object is selected and as it is manipulated.




- **Show Wire Frame:** If this option is chosen, the object will display in wire frame both when the object is selected and as it is manipulated.



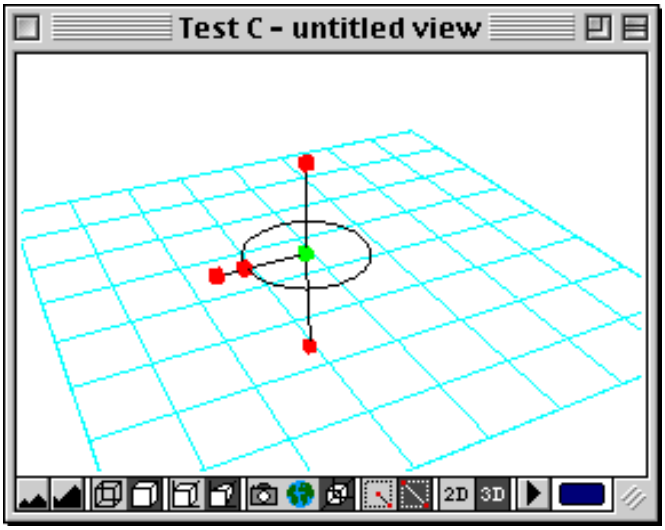
- **If neither option is checked:** The object path will display when the object is selected and the solid object will display as the object is manipulated.



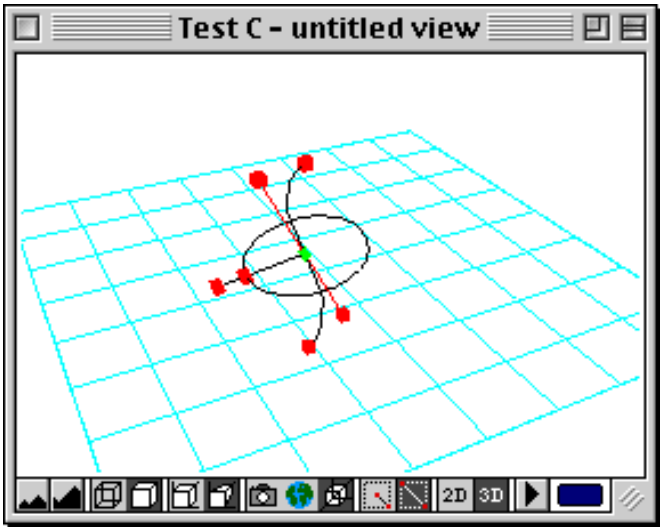

### Selecting Points

Click on a handle to select it.

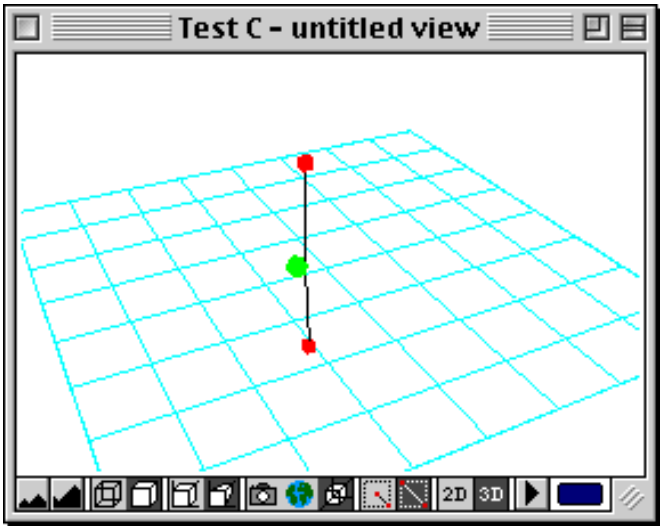
- A vertex or spline point will display with a ring around it, a line extending from the original handle through the ring, and two further handles on the line.



• A Bezier point has two additional handles to adjust the Bezier curve.



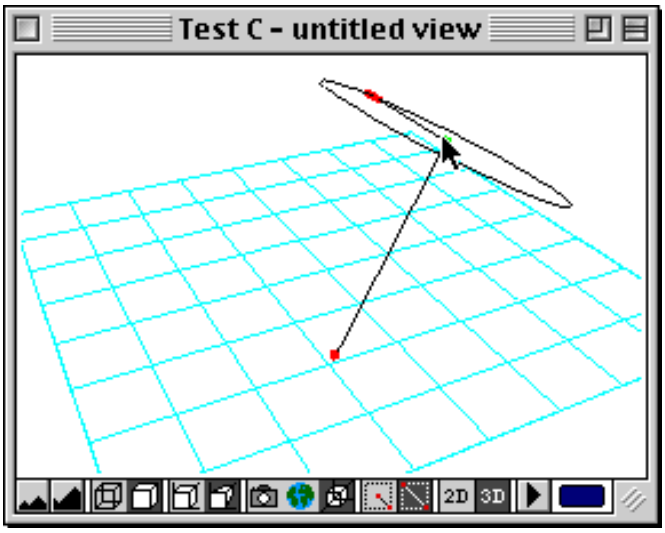

• An arc point has no ring around it and no additional handles.




To select additional points, hold down the Shift key and click on another point. To deselect points, hold down the Shift key and click on a selected point.

### Moving Points On The Path

To move a path handle of any type, click on it and drag.



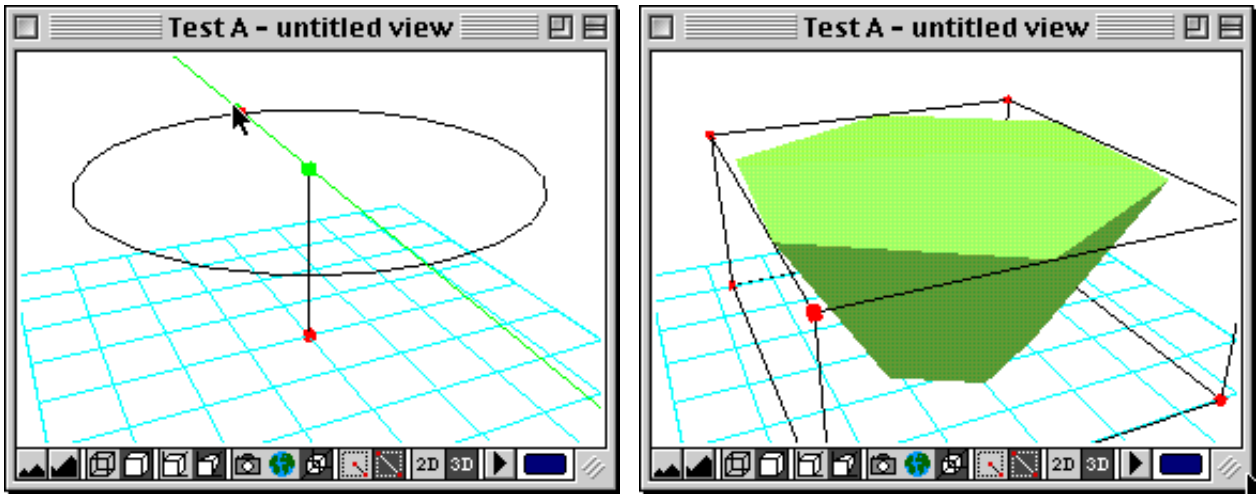

To move a point by precise values, click on the Relative to Path or Relative to World radio button in the Edit Path dialog and enter values in the x, y and z fields.

- **Relative to Path:** The selected point is moved to the values entered relative to the point of the start of the path.
- **Relative to World:** The selected point is moved to the values entered relative to the grid.

### Scaling The Object's Section

The outer of the two handles displayed when a vertex, Bezier or spline point is selected is used to adjust the scale of the object section at that point on the path.

Click on the handle and drag away from or towards the center of the object along the constraining line that appears. The section of the object will be scaled accordingly:




Hold down the Shift key when dragging the handle to snap the handle to 100% increments, based on the size of the original section.

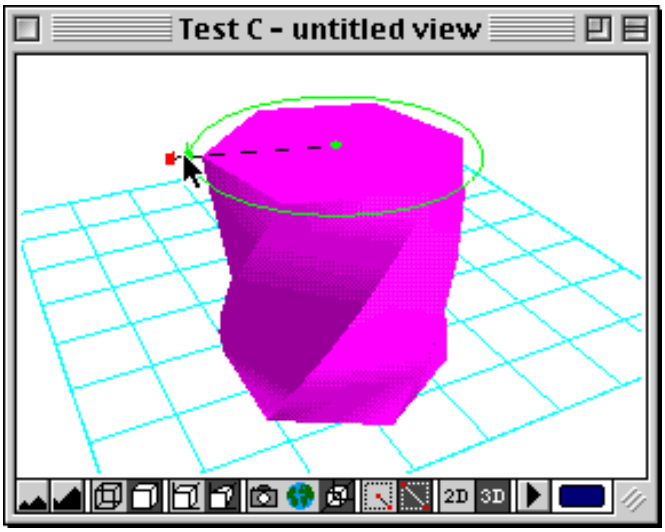
If more than one point is selected, only the specific point being manipulated will be scaled.

To scale the section by a precise percentage value, enter the value in the Scale field in the Edit Path dialog.

#### Rotating The Object's Section

The inner of the two handles displayed when a vertex, Bezier or spline point is selected is used to twist the object by rotating the object's section at that point on the path.

Click on the handle and drag round the circle. The section of the object will be rotated accordingly:



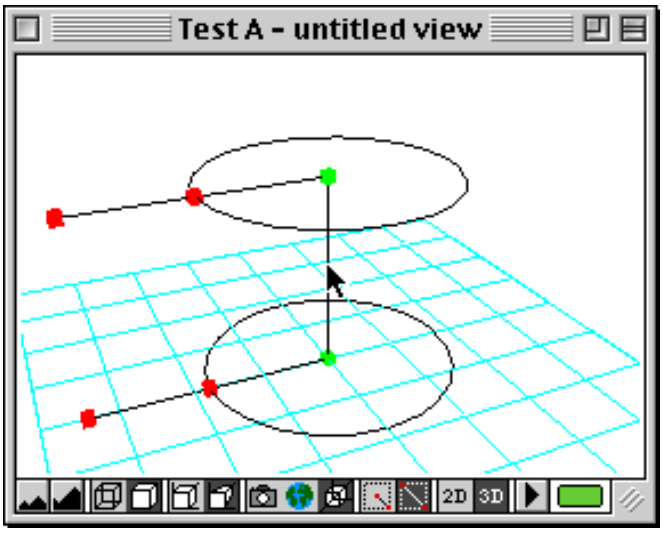

Hold down the Shift key when dragging the handle to constrain the rotation to 45° increments.

If more than one point is selected, the rotation is applied to the section at each selected point on the path.

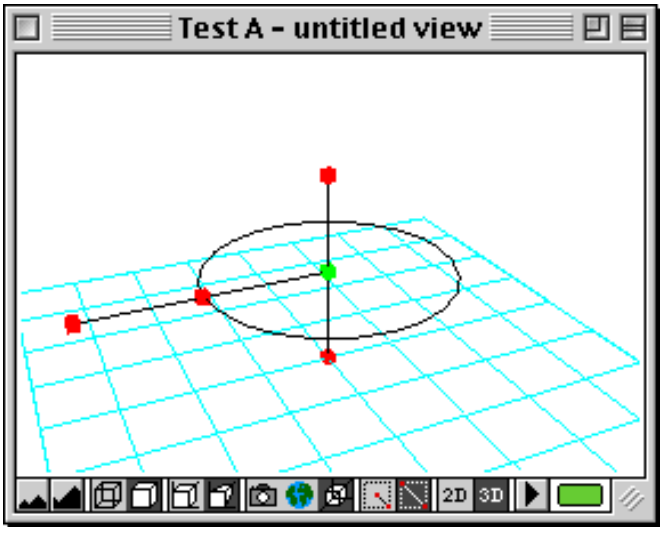
To rotate the section by a precise number of degrees, enter the value in the Twist field in the Edit Path dialog.

### Adding Points To A Path

To add a point to a path, select two contiguous points on the path by clicking on the line between them, or by holding down the Shift key and clicking on a second point:




Click on the Vertex, Arc, Spline or Bezier button in the Edit Path dialog. A point of the specified type will be added between the two points originally selected.




Alternatively, hold down the Option key, click on the path or an existing handle and drag to place a new Vertex point.

**Note:** An arc point can only be added between two vertex points.

### Changing Points

To change a point to a different type, select the point then click on the Vertex, Arc, Spline or Bezier button in the Edit Path dialog. The point will change to the type selected.

**Note:** An arc point can only be added between two vertex points.

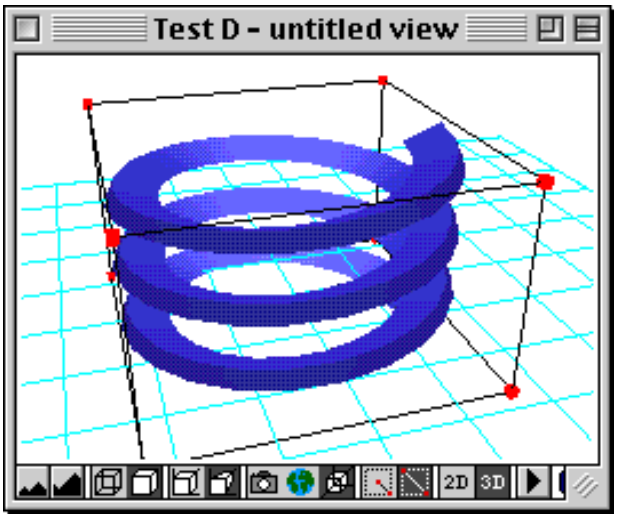
### Manipulating Points

- **Vertex:** Click and drag on the point to move it. Adjust the scale or rotation of the section at that point as discussed earlier in this section.
- **Arc:** Click and drag on the point to move it. Any other adjustments can be performed only by manipulating the vertex points at either end of the arc.
- **Spline:** Click and drag on the point to move it. Adjust the scale or rotation of the section at that point as discussed earlier in this section.
- **Bezier:** Click and drag on the point to move it. Adjust the scale or rotation of the section at that point as discussed earlier in this section. Click and drag on the Bezier handles to adjust the curve. Hold down the Option key and click and drag on the Bezier point or Bezier handles to break the Bezier curve.

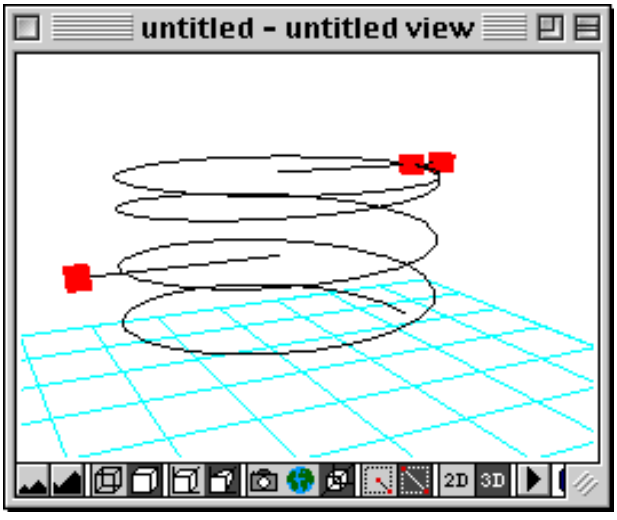
### Editing the Path of a Lathed Object

The path of a lathed object can be adjusted to alter the axial and radial speed and acceleration and the number of turns of the lathe template. For some users, editing the path of a lathed object may be more intuitive than adjusting the Lathe Options. *See Lathe on page G-26 for more details.*

1. Draw a lathed object in your 3D World document. The lathed object below was produced with Lathe Options: Number of turns, 3; Axial Speed Factor, 4.



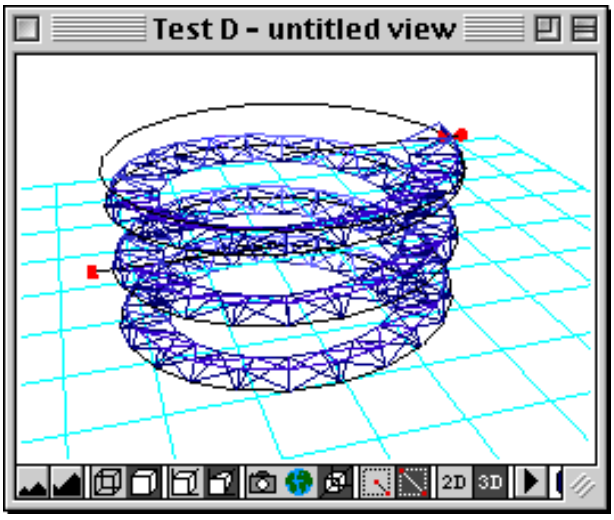

2. With the Edit Path tool selected, click on the object. Its path will display as a black line.




At the end of the object's path is an editing circle. A radius line extends from the lathe axis through the editing circle at the point the object path ends. There is an editing handle at the end of the object path, and a further editing handle at the end of the radius line.

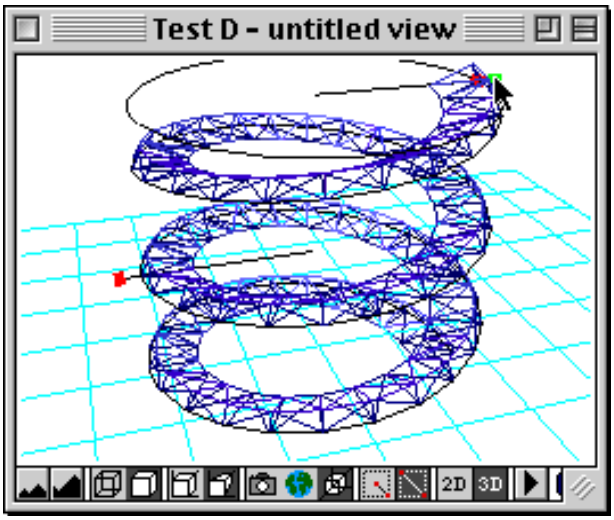
Half way round the lathed object is a second radius line, extending from the lathe axis through the lathe path. A third editing handle is at the end of this radius line.

3. Check the Show Wire Frame checkbox in the Edit Path dialog to see the selected object in wire frame view.



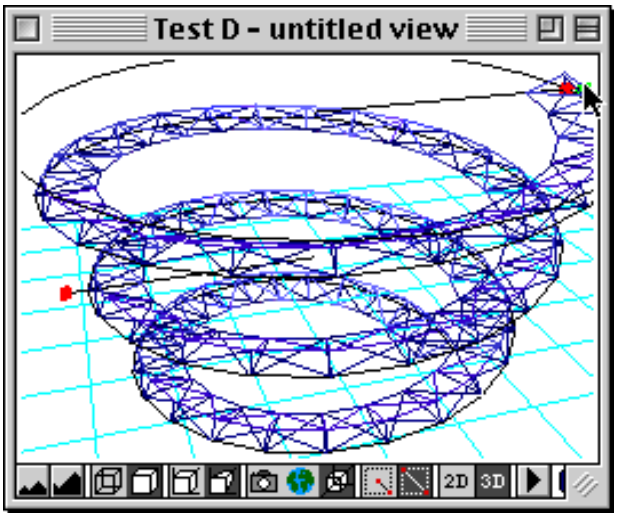

4. Select the outer of the two editing handles at the end of the lathe path. Holding down the mouse button, drag the cursor up or down to stretch or compress the lathed object vertically. This is the same as adjusting the Axial Speed value in the Lathe Options dialog.

   **Note:** Hold down the Shift key to constrain movement to the x or y axis.



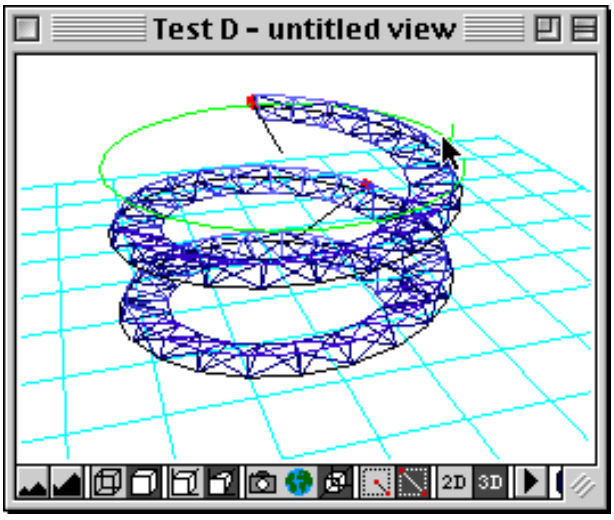
5. Still holding down the mouse button, drag the cursor left or right to increase or reduce the radius of the lathed object. This is the same as adjusting the Radial Speed value in the Lathe Options dialog.

   **Note:** Hold down the Shift key to constrain movement to the x or y axis.

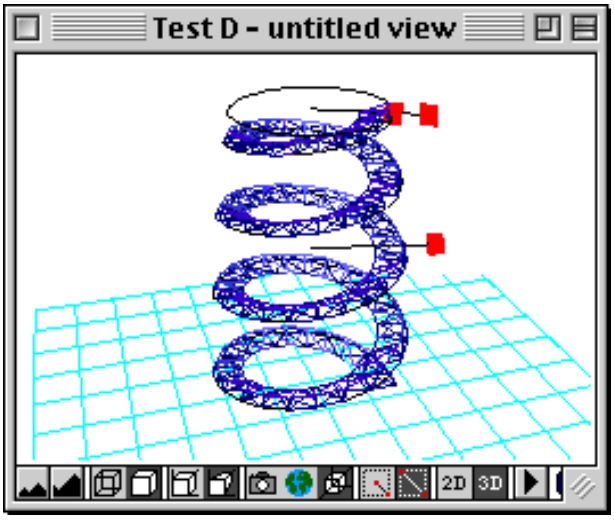



6. Select the inner of the two editing handles at the end of the lathe path or click on the editing circle. Holding down the mouse button, drag the cursor around the circle in either direction to increase or reduce the number of turns of the lathe. The lathed object remains the same height regardless of this adjustment, so the axial speed is adjusted to fit the lathed object, with more or fewer turns, into the same area.

**Note:** Hold down the Shift key to constrain movement to 45° increments.

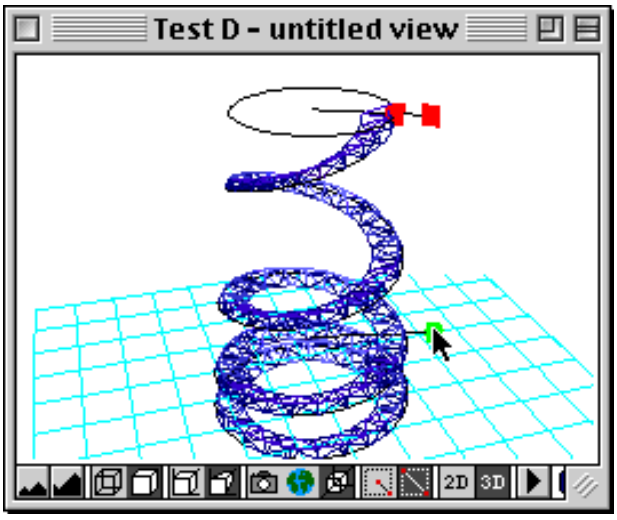



7. Adjust the lathed object so that the radius line and editing handle half way round the object is accessible.



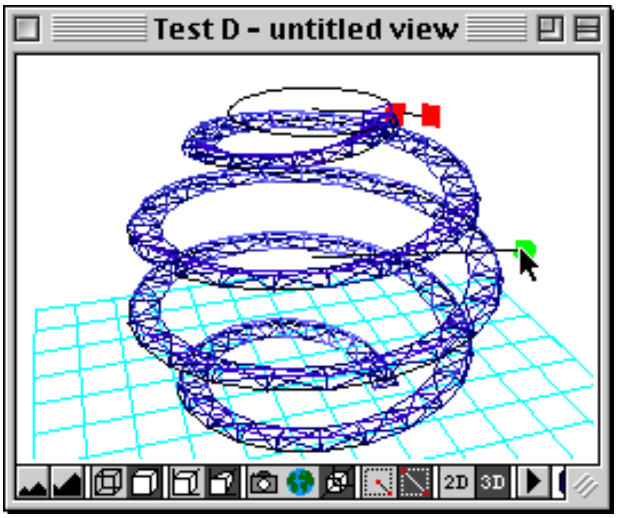

8. Click on this editing handle, hold down the mouse button and drag the cursor up or down to adjust the vertical distribution of the object. The end points of the object are not moved. This is similar to adjusting the Axial Acceleration value in the Lathe Options dialog.

**Note:** Hold down the Shift key to constrain movement to the x or y axis.




9. Click on the editing handle, hold down the mouse button and drag the cursor left or right to adjust the radius of the object at that point. The end points of the object are not moved. This is similar to adjusting the Radial Acceleration value in the Lathe Options dialog.

   **Note:** Hold down the Shift key to constrain movement to the x or y axis.

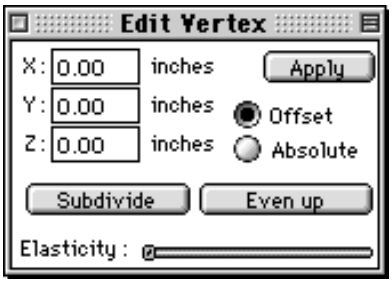



**Note:** Points cannot be added to the path of a lathed object.

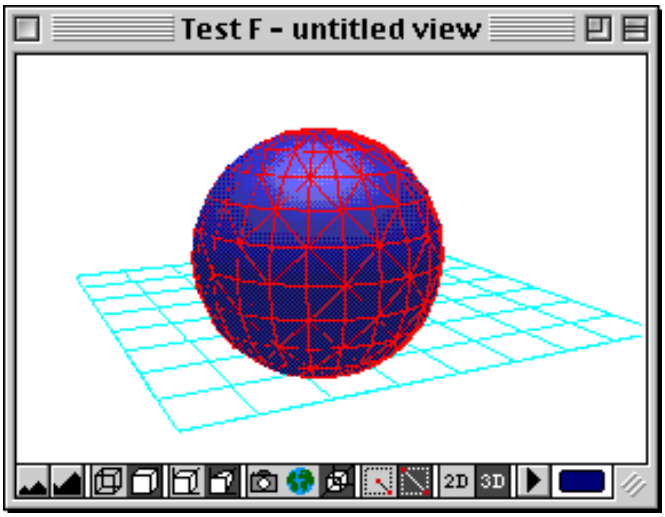
## ◆ Edit Vertex

The Edit Vertex plug-in is used to modify an object by manipulating its vertex points.

Select the Edit Vertex tool and the Edit Vertex palette displays:

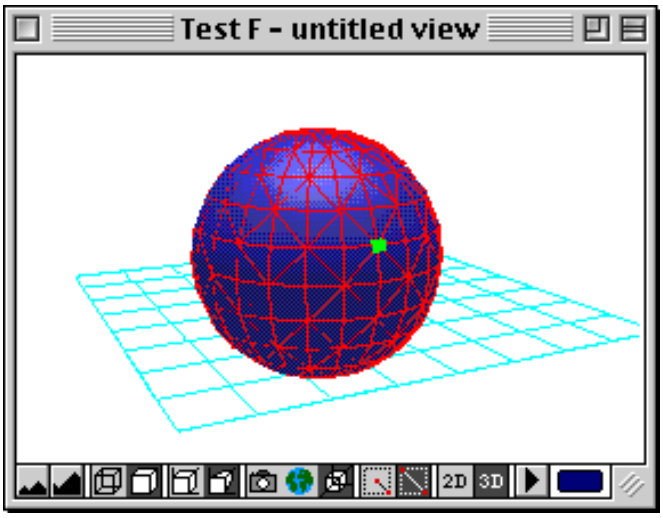



Select an object in the document window. It will display with a red wireframe showing the vertices of the object.



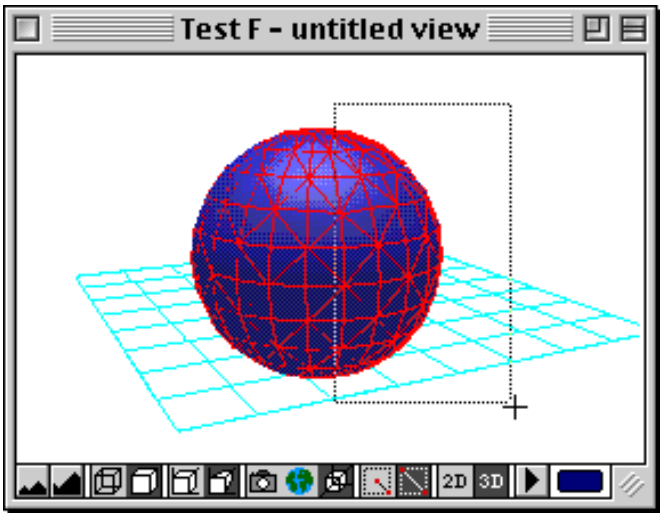
### Selecting Vertex Points

As you move the cursor directly over a vertex point it will change to a white cross. Click on a vertex to select it.

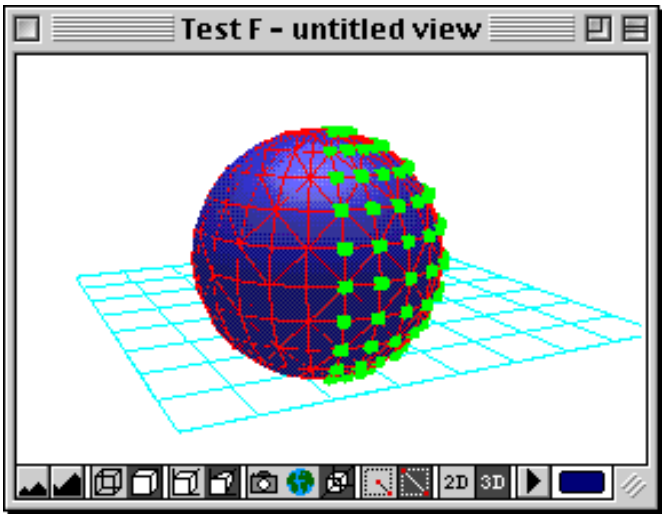



To select additional vertex points, hold down the Shift key and click on further points. Hold down the Shift key and click on a selected vertex point to deselect it.

Multiple vertices can be selected by dragging a bounding box around the points to be selected.



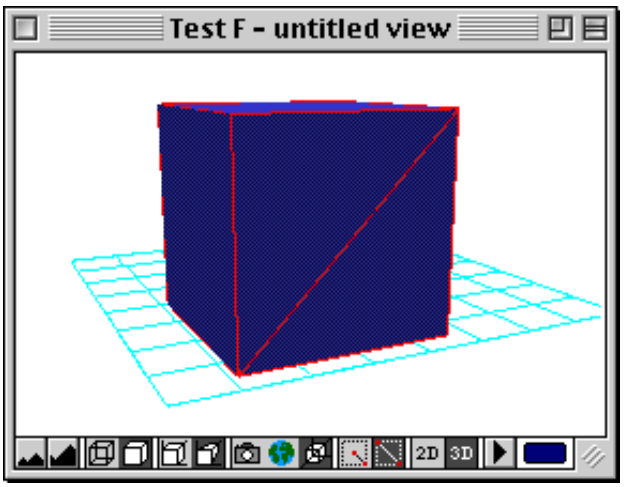
All the vertices within the bounding box will be selected, even those that cannot be seen.

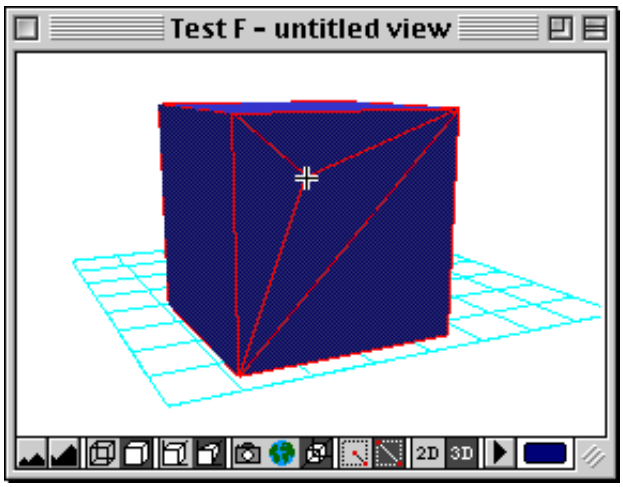



Hold the Shift key down and drag around additional points to increase the selection or hold the Shift key down and drag around selected points to deselect them.

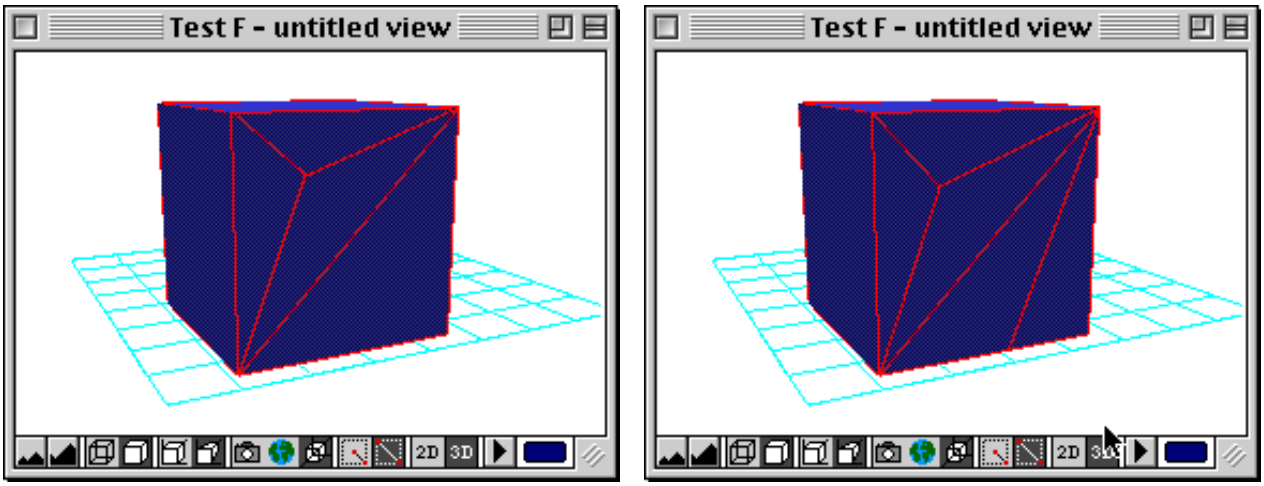
#### Adding Vertex Points

To manually create a new vertex point in the center of one of the triangles that make up an object, hold down the option key and click on the face of a triangle:



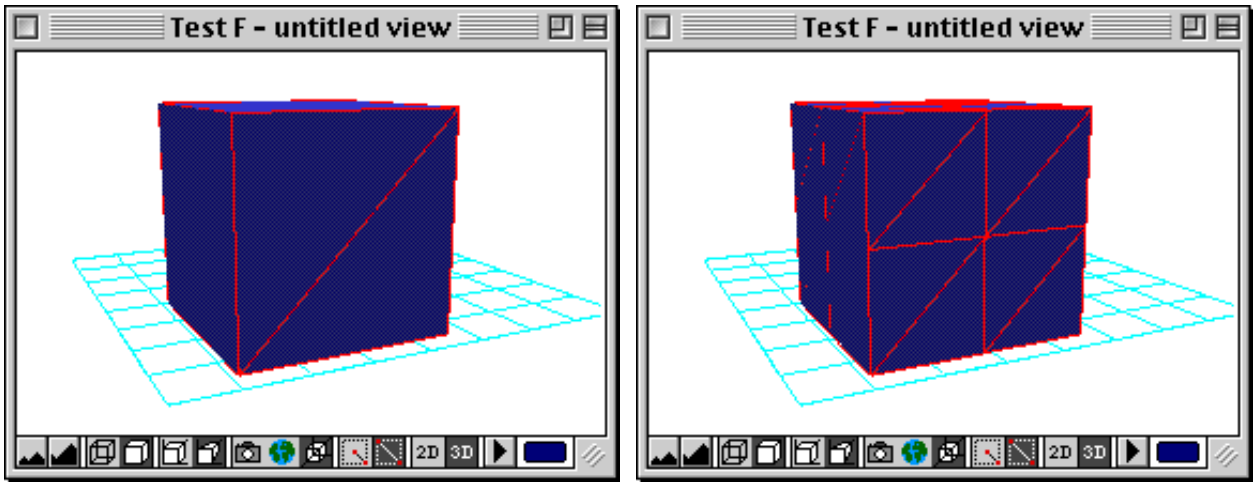



To create a new vertex point on the edge of a triangle, hold down the Option key and click on the edge of a triangle:




**Subdivide**

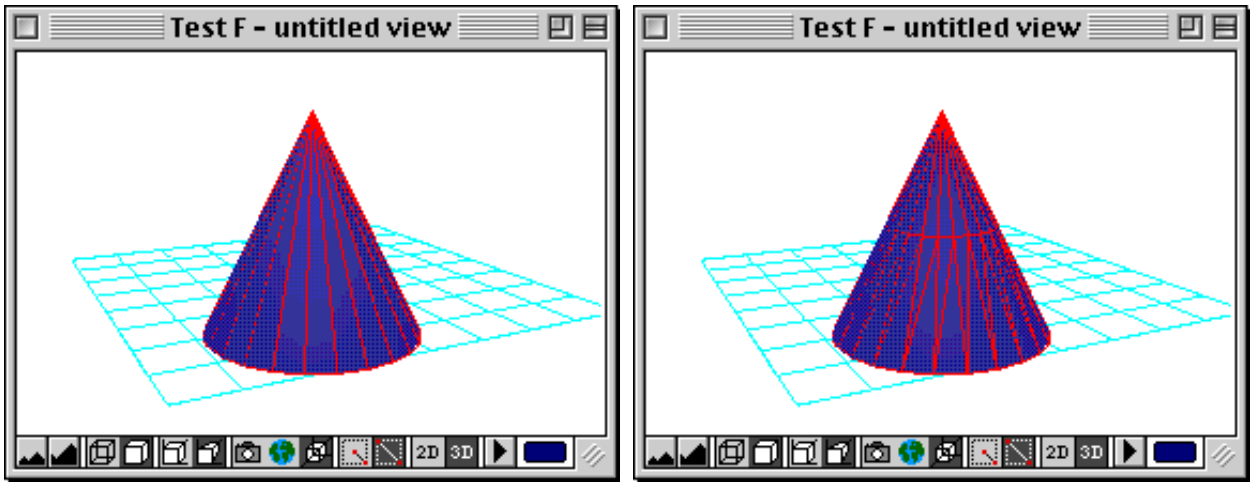
Click the Subdivide button to add vertex points by breaking up an object into more triangles. The center points of each edge of a triangle are joined, dividing every triangle into four. Subdividing an object will create smoother surfaces when editing vertex points.




**Even Up**

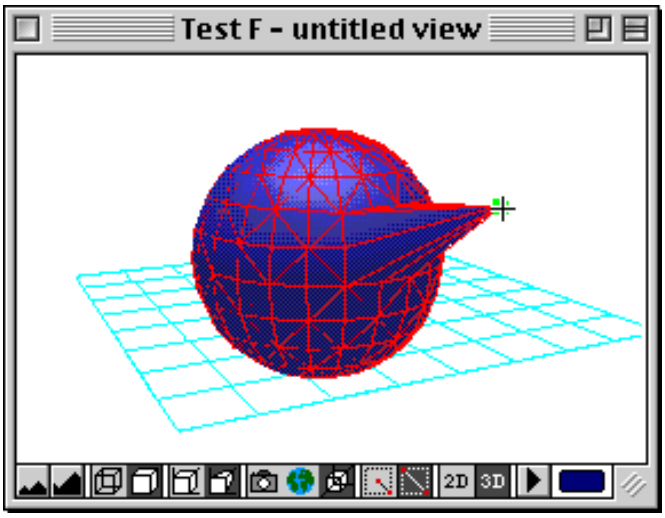
The Even Up button provides another method of subdividing the triangles that make up an object. Triangles are divided in such a way that all the triangles tend towards being the same

size. In the screen shots below, notice that the triangles making up a cone are split in half across the length of the triangle, but not the width of the triangle.




### Moving Vertex Points

To move a vertex point, click on it and drag. Any other selected points will also be moved.




To move a point in the Z dimension, hold down the Control key and drag the point. Hold down the shift key to constrain movement to the X, Y and Z axes

### Offset/Absolute

A single vertex point can be moved a specified amount or to a specific location by using the Edit Vertex palette.

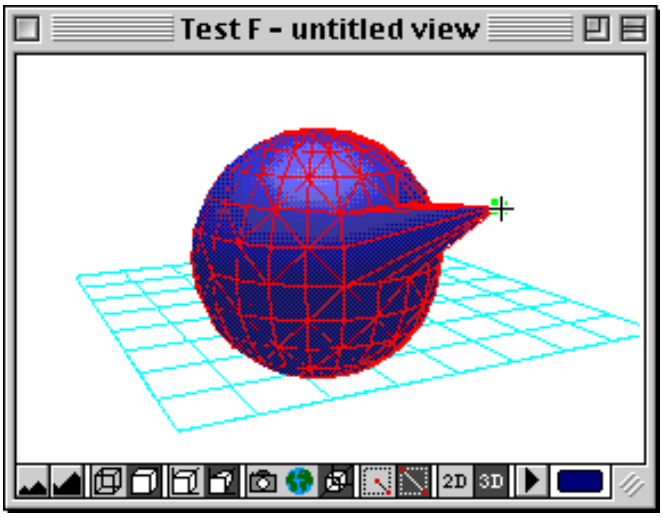
- To move a vertex point by a specified amount, click on the Offset button in the Edit Vertex palette and enter values for the offset in the X, Y and Z fields.
- To move a vertex point to a specific location, click on the Absolute radio button in the Edit Vertex palette and enter values in the X, Y, or Z fields.

Click the Apply button. The vertex point will be moved according to your settings. The position of the elasticity slider will also be taken into account when the point is moved.

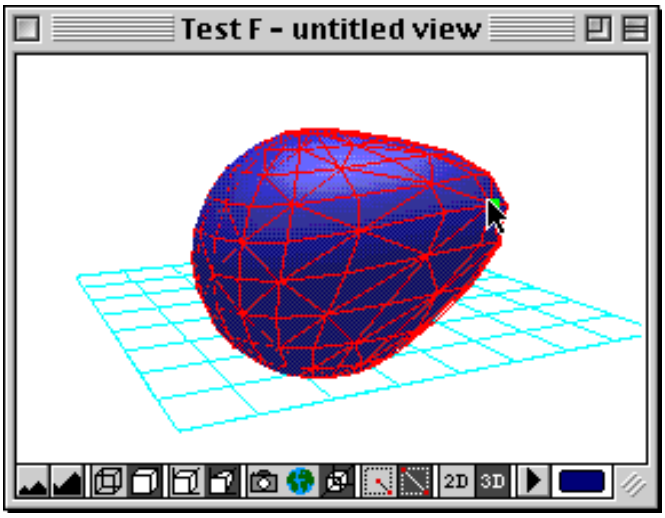
If multiple vertex points are selected they can only be moved relative to their current location, so the Absolute radio button will be grayed out.

### Elasticity

Adjust the elasticity slider to specify how the object will change when a vertex point is moved. If elasticity is zero, when a point is moved any unselected points will remain in their previous positions:



If the elasticity of the object is increased, as a vertex point is moved, other points will also be moved. The distance each point is moved is determined by how far away each point is from the vertex point being moved:




## Gravity

The Gravity plug-in is used to place objects on the grid.

Select the Gravity tool from the Tools palette. As the cursor is moved over the document window it will change to a downward arrow. The active point is at the tip of the arrow. Click on an object and it will be moved so that its lowest point is placed on the grid.

If an object has been locked by clicking on the padlock icon in the top right corner of the Info palette, or by selecting Lock from the Options menu, you will not be able to use the Gravity tool to drop the object to the grid.

If the object position is locked only in the Y-axis, the Gravity tool will over-ride this restraint and can be used to drop the object to the grid. If you have several objects selected, some of which may be locked in the Y-axis, hold down the Shift key when using the Gravity tool to prevent these locked objects from being dropped to the grid.

*See Position on page 4-16 and Lock on page 4-19 for details.*

### The Gravity Menu Command Plug-in

Make a selection in the document window and choose Gravity from the Plug-in menu. The selected object(s) will be placed on the grid.

## ◆ Internet

The Internet plug-in is used to assign URLs (Universal Resource Locations) to 3D objects. The 3D objects can then be used to jump to Web pages on the Internet. You will need an AppleEvent-aware Internet application (like NetScape Navigator) to take full advantage of the Internet tool. AppleEvents are messages sent between applications. 3D World sends out AppleEvents, the Internet application must be able to accept them.

To assign a URL to an object:

1. Select the Internet tool from the Tool palette.
2. Hold down the Command key and move the cursor over the document window, the cursor will change to a hand.
3. Click on an object in the document window.
4. Enter a URL address (and a description, if desired) in the dialog that displays, then click OK.

To jump to a URL location on the Internet:

1. Select the Internet tool from the Tool palette.
2. Move the cursor over the document window. As it passes over an object that has been assigned a URL it will change to the letters URL and an arrow, and the URL description or Internet address assigned to the object will display in the Help Palette. (To display the Help Palette select Help from the Palette menu.)
3. Click on an object which has been assigned a URL. The Internet tool will send out an AppleEvent to an Internet application to locate and display that URL.

## ◆ Light Director

The Light Director plug-in is used to direct one or more spot lights in a particular direction.

Select the light(s) to direct, then select the Light Director tool in the Tools palette. In the document window, click at the place you want the lights to point. The light(s) will be rotated to point at the place specified.

Lights can also be selected using the Light Director tool by selecting the tool and clicking on a light. Hold down the Shift key and click on additional lights to increase the selection. Hold down the Shift key and click on a selected light to remove it from the selection.

## ◆ Make Wireframe

The Make Wireframe plug-in is used to make certain objects display in wire frame regardless of the rendering option selected for the document.

Select the Make Wireframe tool in the Tool palette. Click on an object in the document window and it will display in wire frame mode. Click on the object again to remove the wire frame attribute so that it is rendered normally.

### The Make Wireframe Menu Command Plug-in

Make a selection in the document window and choose Make Wireframe from the Plug-in menu. The object(s) will be displayed in wireframe view. Select the object and choose Make Wireframe from the Plug-in menu again to remove the wire frame attribute so that it is rendered normally.

## ◆ Material

The Material plug-in is used to change an object's surface color, reflective color, transparency, shininess and reflectivity, simply by clicking on the object. Random values or values copied from another object can be applied.

- **To apply random values to an object:** Select the Material tool from the Tool palette. Hold down the Shift key and move the cursor over an object in the document window, the cursor will change to a die. Click on the object to apply random values.
- **To apply the same random values to another object:** Click on the Material tool again. Move the cursor over an object and it will change to a paint bucket. Click on the object.
- **To copy an object's values:** Click on the Material tool and hold down the Option key. The cursor will change to an eye dropper. Click on an item to copy its values.
- **To apply copied values:** Click on the Material tool again and the cursor will change to a paint bucket. Click on the object to which you want to apply the copied values.

### The Material Menu Command Plug-in

Make a selection in the document window and choose Material from the Plug-in menu. If the last time the Material tool was used random values were applied to an object, the same random values will be applied to the selected object(s). If the last time the Material tool was used values were copied from an object, these copied values will be applied to the selected object(s).

## Orbit

The orbit plug-in is used to move the camera around a selected object.

Select the Orbit tool from the Tool palette. Move the cursor over the document window and it will change to a black diamond.

- **Click on an object:** drag the mouse left, right, up, or down and the view will orbit around the center of the object's bounding frame.
- **Click on the grid:** drag the mouse left, right, up, or down, and the view will orbit around that point on the grid.
- **Click in an empty area of the document window:** drag the mouse left, right, up, or down, and the camera will orbit around the center of the grid.

In all cases, the further you move the mouse from the point where you first clicked, the faster the view will move.

## Pencil

The Pencil plug-in is used to draw directly onto 3D objects.

Select the Pencil tool from the Tool palette. Move the cursor over the document window and it will change to a pencil icon. Click and drag the pencil over an object and lines will be drawn onto the texture applied to the object. The lines will be drawn using the default color displayed at the bottom of the document window. If no texture has been applied to the object, a texture will be created using the surface color of the object and measuring 512 x 512 pixels.

## ◆ Print

Use the Print plug-in to display the standard Print dialog and print the current document view. When the Print plug-in is selected, the Renderer Options palette is automatically opened so that you can make any necessary changes to the way the document is displayed. *See Renderer Options on page D-77 for more details.*

Use one of the following methods to display the Print dialog:

- Click on the Print plug-in then click in the document view.
- Hold down the Option key and select the Print tool.
- Click on the Print tool and hold down the mouse button. Select the same tool from the popup menu that displays.

Enter the required number of copies etc. in the Print dialog and click OK to print the view.

## ◆ Random Color

The Random Color Plug-in is used to apply random colors to objects.

Select the Random Color tool from the Tool palette. Move the cursor over the document window and it will change to a hand. Click on an object to apply a random color. If an object has a texture applied to it, the texture will be replaced by the color.

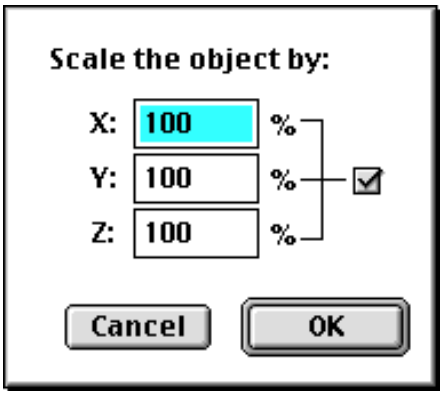
### The Random Color Menu Command Plug-in

Make a selection in the document window and choose Random Color from the Plug-in menu. A random color will be applied to the selected objects.

## ◆ Scale Object

The Scale plug-in is used to easily scale selected objects by percentage values.

1. Select the Scale Object tool from the Tool palette. The Scale Object dialog displays:




2. To maintain an object's proportions, ensure that the constrain checkbox to the right of the dialog remains checked on. Enter a percentage value to scale the object by in the x dimension, the percentage values for the y and z dimensions will be automatically changed to the same value.
3. To scale an object without maintaining its proportions, uncheck the constrain checkbox. Enter percentage values to scale the object in each of the x, y and z dimensions.
4. Click OK, then click on an object in the document window. It will be scaled by the specified value(s).

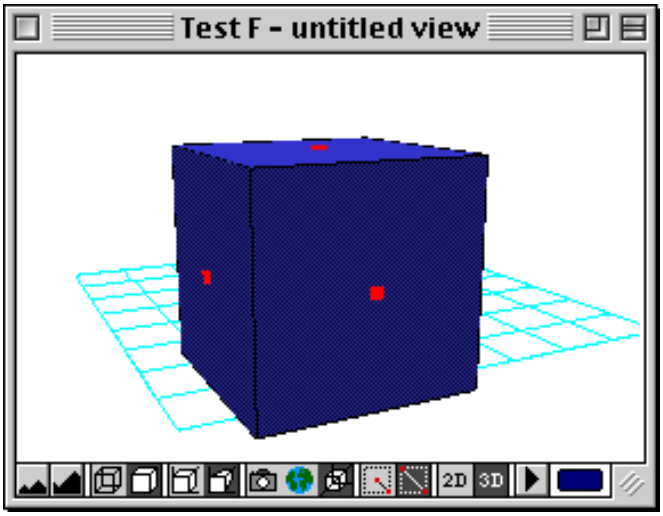
### The Scale Object Menu Command Plug-in

Make a selection in the document window and choose Scale Object from the Plug-in menu, the Scale Object dialog will display. Enter values in the dialog as described in steps 2 and 3 above and click OK. The selected object(s) will be scaled by the specified value(s).

## Shear

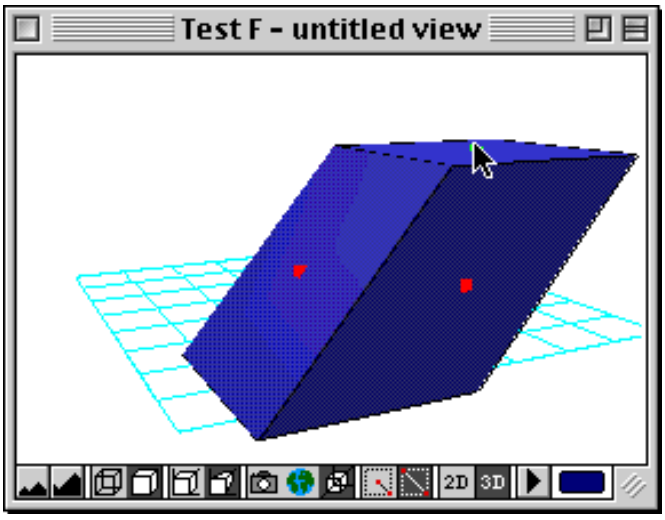
The Shear plug-in is used to distort shapes.

Select the Shear tool from the Tool palette then select an object in the document window. The object's normal bounding frame and handles will not display, instead the object will display in a bounding frame with handles in the center of each surface.




Click on a handle and drag to shear the object. When you move the handle, the surface of the bounding frame opposite the handle you are moving will remain stationary, but the other sur-

faces of the bounding box will move as you drag the handle. The object will be distorted to continue to fit in the bounding frame.




To move a handle in the Z dimension, hold down the control key as you drag. To constrain the movement of the handle to the X, Y, or Z axis, hold down the shift key as you drag.

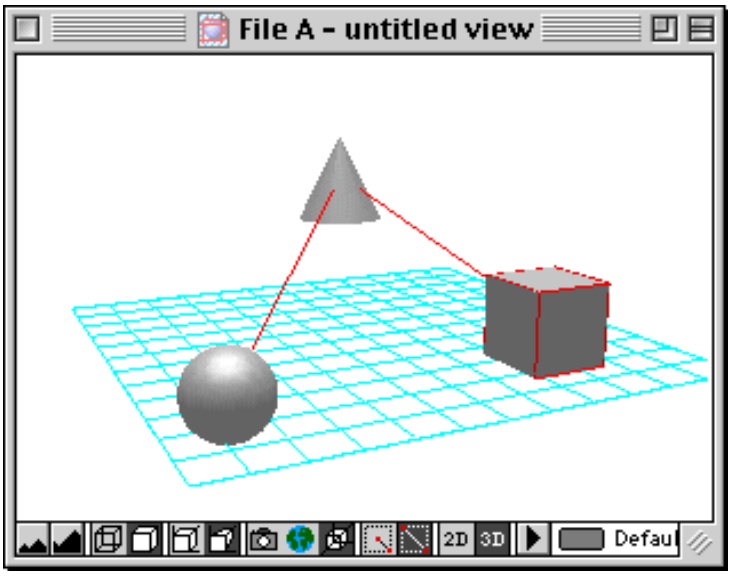
## ◆ Skin

The Skin plug-in is used to wrap a skin around objects creating a new geometry. This is useful for creating complex geometries.

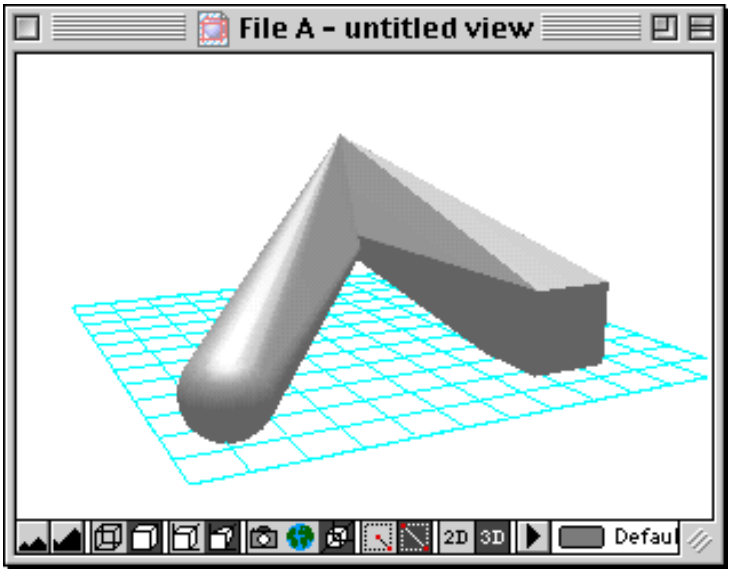
The Skin plug-in is available as both a Plug-in Menu Command and a Plug-in Modifier tool. The plug-in works in a slightly different way depending on whether the tool or the menu command is used.

1. Select the Skin tool in the Tools palette.

2. In the document window, select objects *in the order you wish them to be skinned*.



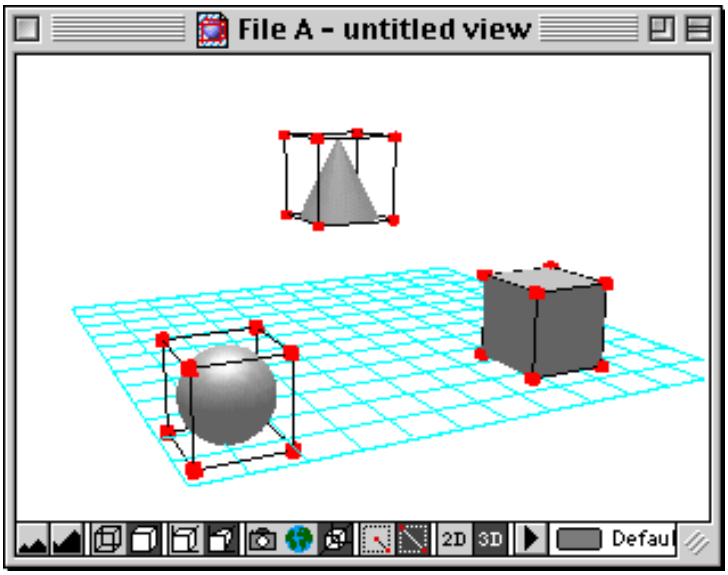

3. A skin will be stretched around the object selected first to the object selected second and so on.



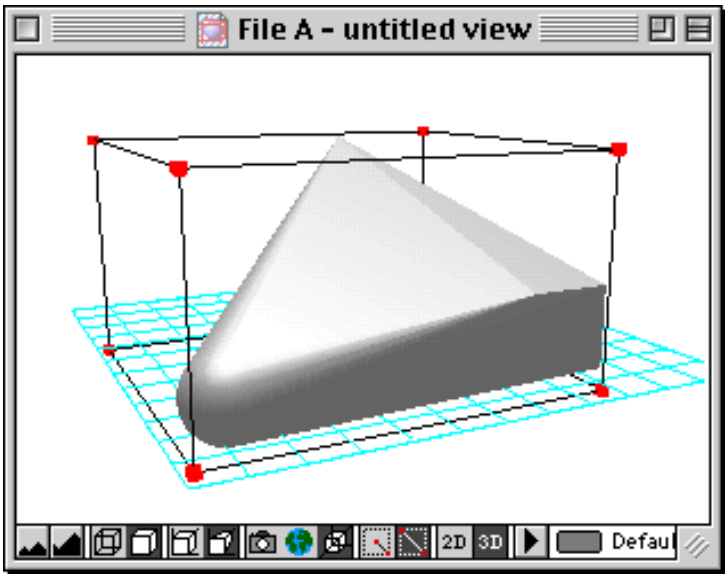

**Note:** The original objects are deleted and replaced by a series of new geometries that are grouped together.

### The Skin Menu Command Plug-in

1. Select objects in the document window.




2. Choose Skin from the Plug-in menu. A skin is stretched over the entire group of selected objects.




**Note:** The original objects are deleted and replaced by the single new geometry.

## Spin

The Spin plug-in is used to spin objects continuously.

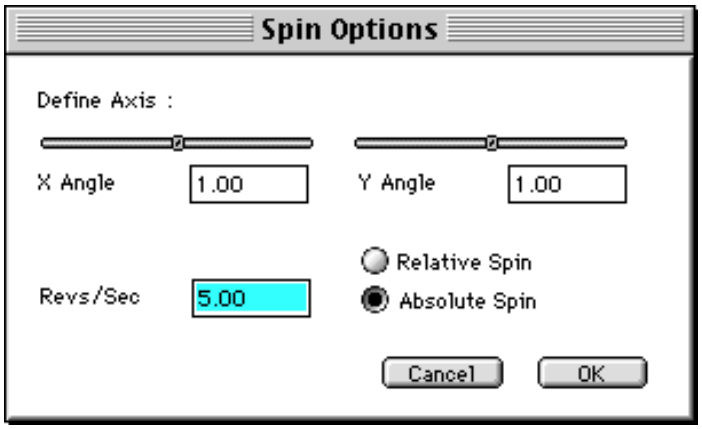
Select the Spin tool from the Tool palette and move the cursor over an object in the document window. The cursor will change to an arrow around an axis line. Click on the object and drag to set the direction and speed of the spin. Hold down the shift key to constrain the direction of spin to the X or Y axis.

- **Spin axis:** By default the object spins around the point at the center of its bounding sphere, relative to the object's position. If the object is moved, the point of rotation will be determined by its new position. If the Option key is held down when the spin is applied to an object, the object will always spin around the point determined by the center of its bounding sphere in its current position. If the object is moved, the point of rotation will not change.
- **Spin direction:** The rotation direction is determined by the direction the cursor is dragged after the object is clicked on.
- **Spin speed:** The speed of the rotation is determined by the distance between the original clicking point and the point the mouse button was released, and the length of time the mouse button was held down.

To remove the Spin attribute from an object, select the Spin tool, hold down the option key and click on the object again.

### The Spin Menu Command Plug-in

Make a selection in the document window and choose Spin from the Plug-in menu. The Spin Options dialog will display:




- **Spin direction:** Click and drag on the Define Axis slider bars to adjust the X and Y axes to determine the spin direction.
- **Spin speed:** Enter a value in the Revs/Sec field to specify how many times the object should revolve per second.
- **Relative:** Click on the Relative Spin radio button to spin an object around the point at the center of its bounding sphere. If the object is moved, the point of rotation will be determined by its new position.
- **Absolute:** Click on the Absolute Spin radio button to always spin an object around the point at the center of its bounding sphere at this time. If the object is moved, the point of rotation will remain the same.

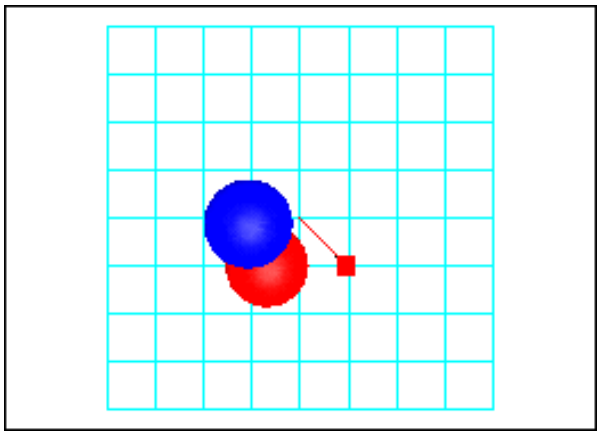
Click OK and the spin will be applied to the selected objects.

## ◆ Sun Direction

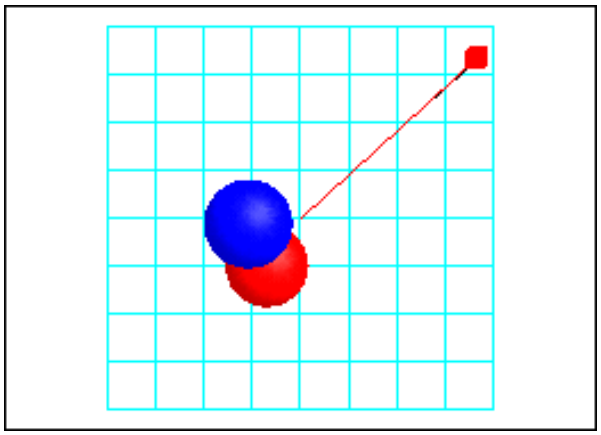
The Sun Direction plug-in is used to adjust the direction the sun light shines in.

When the Sun Direction plug-in is selected, the Lights palette is automatically opened so that you can make any necessary changes to the way the scene is lit. *See Lights on page D-70 for more details.*

1. Select the Sun Direction tool from the Tools palette.
2. The document window changes to show a top view. The current direction the sun light is shining in is depicted as a red line with a handle at the end:



3. Click on the handle and holding down the mouse button drag to change the position of the source of the sun light.



4. Hold down the Control key as you drag to move the position of the source of the sun light closer or further away.
5. Movement of the sun direction line can be constrained to the X, Y and Z axes by holding down the Shift key.
6. Release the mouse button to drop the handle at its new location.

## Take Picture

Click on the Take Picture plug-in to save a PICT image of the window contents at 72dpi.

When the Take Picture plug-in is selected, the Renderer Options palette is automatically opened so that you can make any necessary changes to the way the document is displayed. *See Renderer Options on page D-77 for more details.*

Use one of the following methods to display the standard Save dialog:

- Click on the Take Picture plug-in then click in the document view.
- Hold down the Option key and select the Take Picture tool.
- Click on the Take Picture tool and hold down the mouse button. Select the same tool from the popup menu that displays.

Specify a name for and location to save the file in the save dialog and click OK to save the image.

## Teleport

The Teleport plug-in is used to move the camera's view either to the center of an object clicked on, or to a specified point in an empty area of the document.

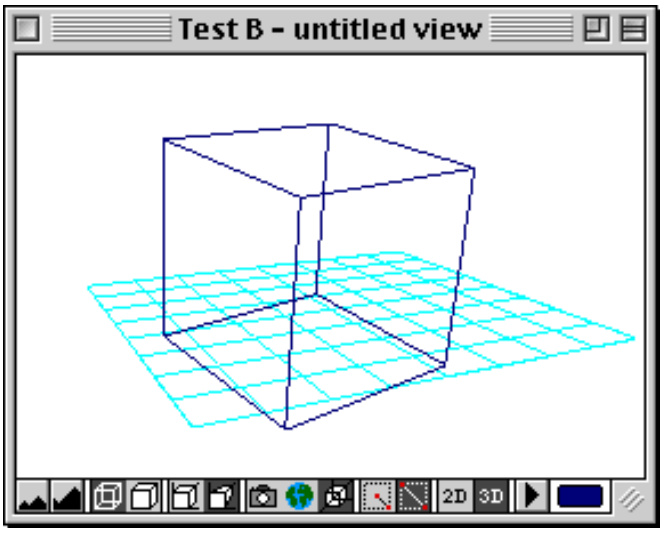
Select the Teleport tool from the Tool palette and move the cursor over the document window. It will change to an upwards pointing arrow. Click on the object you wish to teleport into.

The Teleport tool can be used to quickly place the camera at a specific point. To do this, create an object and position it where you want the camera to be, use the Teleport tool to position the camera at the center of the object, then delete the object.

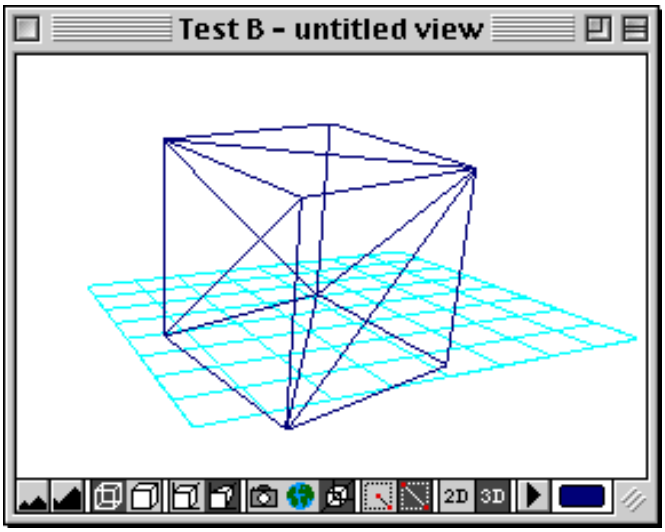
## ◆ Triangulate

The Triangulate plug-in is used to break an object or group up into its constituent triangles.

1. Select the Triangulate tool from the Tool palette.
2. Click on an object or group in the document window.



3. The object or group will be broken up into its constituent triangles.




4. Depending on the geometry clicked on, you may not be able to see any difference in the object, even in wire frame mode. However the object can now be ungrouped and individual triangles manipulated or deleted.

## ◆ VR

The VR plug-in is used to pan and tilt the camera using control mechanisms similar to those found in QuickTime™ VR.

When the VR plug-in is selected, the NaviCam palette is automatically opened so that you can use it to make changes to the camera position and view. *See NaviCam on page D-72 for more details.*

Select the VR tool from the Tools palette and click in your document window.

- To pan the camera (turn it left and right): hold down the mouse button and drag the mouse left and right.
- To tilt the camera: hold down the mouse button and drag the mouse up and down. The tilt is limited to +/- 90°.
- To crab the camera (move it to the left or right): hold down the mouse button and the Command key and drag the mouse left and right.
- To move the camera forwards and backwards: hold down the mouse button and the Command key and drag the mouse up and down.
- To zoom in: hold down the Shift key.
- To zoom out: hold down the Control key.

As you move, the cursor changes to an arrow head pointing in the direction you are moving. In all cases, the further you move the mouse from the point first clicked on, the faster the camera will move.

Alternatively, select the VR tool and use the arrow keys to move the camera:

- To pan the camera (turn it left and right): use the left and right arrow keys.
- To tilt the camera: use the up and down arrow keys. The tilt is limited to +/- 90°.
- To crab the camera (move it to the left or right): hold down the Command key and use the left and right arrow keys.

To move the camera forwards and backwards: hold down the Command key and use the up and down arrow keys.

## Walkthrough

The Walkthrough plug-in is used to walk the camera through a scene.

Select the Walkthrough tool from the Tool palette. Click in your 3D World document window and the cursor will change to a black diamond. Drag the mouse to the left and right to move in those directions, or up to move forwards and down to move backwards. Use the left and right arrow keys to crab (move side to side), and the up and down arrow keys to tilt the camera.

As you move, the cursor changes to a black arrow head pointing in the direction you are moving. In all cases, the further you move the mouse from the point first clicked on, the faster the camera will move.

# *Appendix I*

# *Microspot Plug-in Renderer*

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Introduction I-2



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## ◆ Introduction

The Microspot Renderer is a QuickDraw 3D™ plug-in renderer that provides the following features in addition to those provided by the software QuickDraw 3D interactive renderer: transparency; shadows; pixel level lighting calculations; image anti-aliasing. These features allow you to render a high quality, more realistic 3D scene — in particular the pixel level lighting calculations give more accurate representations of how lighting affects surfaces.

The Microspot Renderer is not included in the 3D World application, but can be purchased as a separate item. Contact your dealer or Microspot for details. *See Technical Support on page 1-11 for contact details.*

# *Appendix J*

# *Drag and Drop*

This section discusses dragging and dropping colors, 3D objects, text, TIFF, JPEG, GIF and Movie files to and from Interiors documents.

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| Drag Input | J-3 |
| Notes | J-4 |




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## DRAG OUTPUT

You can drag a color from the Window control panel, Lights Palette or Info Palette to:

- A 3D object in 3D World
- The Scrapbook
- Another Lights Palette or Info Palette color or any other palette that includes color buttons.
- Desktop patterns
- The Finder Desktop or a Folder window
- The Finder Trash Can
- A 3D World library
- A PICT-compatible, Drag & Drop aware application (like PhotoShop 3.0.4 or later)

You can drag a 3D object or an entire scene (by holding down the Option key and clicking on the background) to:

- Another view of the same file in 3D World
- The window of a different file in 3D World
- A 3DMF-compatible, Drag & Drop aware application
- A PICT-compatible, Drag & Drop aware application (like PhotoShop 3.0.4 or later)
- The Scrapbook
- Desktop patterns
- The Finder Desktop or a Folder window
- The Finder Trash Can (to delete the object)
- A 3D World library
- The Puzzle

You can also drag:

- A 3D object with a sound attribute to a sound-compatible, Drag & Drop aware application
- A 3D object with a text attribute to a text-compatible, Drag & Drop aware application like SimpleText or NotePad

## COPY

When you copy selected items from a 3D World document, the following types of data are put on the Clipboard:

- A PICT of the selected items which is the same size as the front window
- A 3DMF as a single grouped item.
- A sound if a selected item has a sound attribute
- Text if there is a text marker included in the selection

## DRAG INPUT

Drag a PICT file from the Finder to:

- A 3D object to create a texture of the picture wrapped around the object
- The document window to make a background picture
- The document window to make a foreground picture (hold down the Control key when dropping the file)
- The grid to make a rectangle with a texture of the picture

Drag a text file from the Finder to:

- A 3D object to create a texture of the text wrapped around the object
- The background to make a background picture of the text
- The grid to create a text marker

Drag a TIFF, JPEG GIF or Movie file from the Finder to:

- A 3D object to create a texture of the text wrapped around the object (if the Textures palette plug-in is installed in the Plug-ins folder).

Drag a 3DMF file from the Finder to:

- A 3D World document (to import it)

Drag a sound file from the Finder to:

- A 3D object (to add the sound as an attribute)
- The grid or background to create a sound marker

Drag a clippings file of the following type from the Finder:

- A PICT clipping (See Drag a PICT file from the Finder)
- A text clipping (See Drag a text file from the Finder)
- 3DMF clipping (See Drag a 3DMF file from the Finder)
- Sound clipping (See Drag a sound file from the Finder)

Drag a 3D World color clipping file (created by dragging a color from a color button into the Finder) from the Finder to:

- A 3D object to change its color
- The grid to change its color
- The background to change its color
- The window toolbar to change the default color, as well as any selected items
- The Lights Palette to change the color of the appropriate light
- The Info Palette to change the color of the selected object/light
- Any other palette that includes color buttons

Other applications that you can drag data into 3D World from:

- The Scrapbook (PICT, text, sound, 3DMF, 3D World color)
- A 3D World library (PICT, text, sound, 3DMF, 3D World color, Movie)
- The NotePad (text)
- The Puzzle (PICT)
- Desktop Patterns (PICT)
- PhotoShop 3.0.4 or later (PICT)

## NOTES

- To drag and drop locked items out of a 3D World document window, hold down the Option key.
- Holding down the Control key as you drag and drop an item onto an object or group ungroups the object or group and places the item on just one surface of the object, or on one item in the group.
- Hold down the Option key as you drag a 3D object to leave a duplicate in the same place as the original.

# *Appendix K*

# *Plug-in Directory*

Lists the application's plug-ins by name, provides details of the plug-in's type and offers a brief description of its use.



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| # | Name | Type | Use the plug-in to… |
|---|---|---|---|
| 1 | 3D Controller | Menu Command & Palette | Specify how a third party 3D Controller device should control the 3D World environment. |
| 2 | 3D Movie | Export | Export a 3DMF QuickTime® movie with a 5 sec, 360° rotation. |
| 3 | 3D Paint | Modifier | Paint or modify textures directly on 3D objects. |
| 4 | 3D Text | Geometry | Create three dimensional text. |
| 5 | 3DMF Text | Export | Produce a 3DMF text file format of a 3D scene. |
| 6 | 4 Walls | Geometry | Create a regular 4 walled room. |
| 7 | Add Backface Style | Menu Command | Correctly define object back faces. |
| 8 | Add UV | Menu Command & Modifier | Prepare an object to accept a texture. |
| 9 | Alignment | Palette | Align objects in any or all of the X, Y and Z axes. |
| 10 | Animate Camera | Menu Command | Animate the camera along a predefined path. |
| 11 | Animate Color | Menu Command & Modifier | Animate the color of an item or group of items. |
| 12 | Animate Object | Modifier | Animate an object along a predefined path |
| 13 | Animate Textures | Menu Command & Modifier | Animate the texture applied to an object. |

| # | Name | Type | Use the plug-in to… |
|---|---|---|---|
| 14 | Animation Player | Palette | Control the display of animation in the document and record animations as QuickTime movies. |
| 15 | Animation Tweener | Palette | Set tween points for objects or the camera. |
| 16 | Anti-Alias | Menu Command | Instruct supporting renderer to anti-alias image. |
| 17 | Array Duplicate | Menu Command | Duplicate an object in any or all of the x, y and z axes, by a specified offset, a specified number of times. |
| 18 | AutoSave | Menu Command | Display alert to save document at specified intervals. |
| 19 | Axis | Palette | Display the current orientation of the front window's camera. |
| 20 | Bevel | Palette | Apply a bevel to a path/section geometry. |
| 21 | Bomb | Menu Command & Modifier | Blow up and delete selected objects. |
| 22 | Camera | Palette | Change the window view. |
| 23 | Ceilings | Menu Command | Add ceilings to selected objects drawn with the 4 Walls or Walls drawing tools. |
| 24 | Color | Menu Command & Modifier | Change the color of objects simply by clicking on them. |
| 25 | Color Palette | Palette | A repository for 12 colors. |
| 26 | Compress Textures | Menu Command | Reduce the amount of disk space used by textures. |

| # | Name | Type | Use the plug-in to… |
|---|---|---|---|
| 27 | Cone | Geometry | Draw cones. |
| 28 | Construct | Modifier & Palette | Perform Boolean operations. |
| 29 | Construct Idler | Menu Command | Performs Boolean calculations and automatically simplifies objects. |
| 30 | Convert To Mesh | Menu Command | Convert QuickDraw 3D 1.5 geometries, NURBs and general polygons into QuickDraw 3D 1.0 mesh geometries. |
| 31 | Counter | Menu Command | Count the number of objects and triangles in the selection or scene. |
| 32 | CSG | Palette | Perform interactive Boolean operations. (*Requires Apple's QuickDraw 3D hardware renderer.*) |
| 33 | Cube | Geometry | Draw rectangles and cubes. |
| 34 | Cursor Options | Palette | Alignment, snapping and cursor display controls. |
| 35 | Cylinder | Geometry | Draw ovals and cylinders. |
| 36 | Delete Attributes | Menu Command & Modifier | Delete attributes applied to objects. |
| 37 | Dimension | Geometry | Add dimensions to objects. |
| 38 | Distance | Modifier | Measure the distance between two points. |
| 39 | Draw Direct | Menu Command | Draw objects directly to screen. |

| # | Name | Type | Use the plug-in to… |
|---|---|---|---|
| 40 | Draw Direct Idler | Idler | Draw direct to screen when a non-interactive renderer is selected, draw into a buffer when an interactive renderer is used. |
| 41 | DXF | Import | Import DXF files as 3DMF. |
| 42 | DXF File | Export | Save the document in DXF format. |
| 43 | Earthquake | Menu Command | Shake the view as though an earthquake were occurring. |
| 44 | Edit NURB | Modifier | Edit NURB objects by manipulating their NURB control points. |
| 45 | Edit Path | Modifier | Edit the path of a geometry and scale and rotate its section at specific points on its path. |
| 46 | Edit Vertex | Modifier | Edit objects by manipulating their vertex points. |
| 47 | Enable Tinted Textures | Menu Command | Allow the texture of an object to be tinted with the object's surface color. |
| 48 | Extrude Bitmap | Import | Import a 2D PICT, TIFF, JPEG, GIF or Picture clipping file as a 3D path/section geometry. |
| 49 | Find | Palette | Find objects by object characteristics. |
| 50 | Floors | Menu Command | Add floors and ceilings to selected objects drawn with the 4 Walls or Multi Walls drawing tools. |
| 51 | Fog | Palette | Add a fog effect to the scene. |

| # | Name | Type | Use the plug-in to… |
|---|---|---|---|
| 52 | Furnishings | Geometry | Easily access furniture items to place in your document. |
| 53 | Gears | Geometry | Draw gears or cogs. |
| 54 | Gradient | Palette | Apply color gradients to the surfaces of objects. |
| 55 | Gravity | Menu Command & Modifier | Place objects on the document grid. |
| 56 | Group Special | Palette | Produce further copies of a selection and apply transformations to the copies based on the original selection's size and position. |
| 57 | Interactive | Menu Command | Automatically switch the document from non-interactive rendering to interactive rendering, and back again. |
| 58 | Internet | Modifier | Assign URLs (Universal Resource Locations) to 3D objects and use the 3D objects to jump to internet locations. |
| 59 | Irregular Polygon | Geometry | Draw the cross section of an irregular shape which is extruded to produce a 3D geometry. |
| 60 | Lathe | Geometry | Draw a lathe template which is revolved around an axis to produce a 3D geometry. |
| 61 | Layers | Palette | Locate different objects on various layers and show or hide them as required. |
| 62 | Libraries | Palette | Store and retrieve data. Contain hundreds of furniture and accessory items. |

| # | Name | Type | Use the plug-in to… |
|---|---|---|---|
| 63 | Light Director | Modifier | Direct one or more spot lights to point in a particular direction. |
| 64 | Light String | Geometry | Position identical lights allong a specified line. |
| 65 | Lights | Palette | Control the application's lighting features. |
| 66 | MacInteriors | Import | Import 3D data files from Microspot's MacInteriors application. |
| 67 | Make Wireframe | Menu Command & Modifier | Display specified objects in wire frame view. |
| 68 | Material | Menu Command & Modifier | Change an object's surface attributes. |
| 69 | Math Graph | Geometry | Enter a 3D surface based on a mathematical formula. |
| 70 | Mountain | Geometry | Create a single mountain peak. |
| 71 | Mountains | Geometry | Create a range of mountain peaks. |
| 72 | NaviCam | Palette | Control the camera position and view. |
| 73 | Nudge | Palette | Move or rotate an object by a specified amount. |
| 74 | Orbit | Modifier | Orbit the camera around a selected object or point. |
| 75 | Pencil | Modifier | Draw lines directly onto 3D objects. |
| 76 | PhotoLink | Idler | Link the application to Adobe PhotoShop or any PhotoShop plug-in compliant application. |

| # | Name | Type | Use the plug-in to… |
|---|---|---|---|
| 77 | Picker | Palette | Display a color picker to easily change the default, or an object's, color. |
| 78 | Picture | Export | Save the document view as a PICT, TIFF or JPEG image. |
| 79 | Pie Chart | Geometry | Create 3D Pie Charts. |
| 80 | Pipes | Geometry | Draw pipes of a specified diameter. |
| 81 | Point Light | Geometry | Place point lights. |
| 82 | Print | Modifier | Display the standard Print dialog to print current document view. |
| 83 | Pyramid | Geometry | Draw pyramid geometries with a specified number of sides. |
| 84 | Rain | Menu Command | Create the effect of rain in the document. |
| 85 | RAM | Palette | Display the memory usage of the application and the amount of free system RAM available. |
| 86 | Random Color | Menu Command & Modifier | Apply random colors to objects. |
| 87 | Regular Polygon | Geometry | Draw regular polygons with a specified number of sides. |
| 88 | Remove Styles | Menu Command | Remove styles applied to objects. |
| 89 | Renderer Options | Palette | Change the way the document and objects within it are displayed. |

| # | Name | Type | Use the plug-in to… |
|---|---|---|---|
| 90 | Relief | Geometry & Import | Create a 3D surface from a picture contained in a PICT file, the clipboard or a picture clipping. |
| 91 | Save Textures | Menu Command | Save the texture on a selected object in PICT, JPEG or TIFF format. |
| 92 | Scale Object | Menu Command & Modifier | Scale selected objects by percentage values. |
| 93 | Section | Palette | Edit the section of path/section geometries. |
| 94 | Shear | Modifier | Distort geometries. |
| 95 | Size Window | Menu Command | Specify the size of the of the application's document window in pixels. |
| 96 | Skin | Menu Command & Modifier | Wrap a skin around objects to create a new geometry. |
| 97 | Smooth | Menu Command | Improve the appearance of objects by giving them a smoother surface. |
| 98 | Sound Marker | Geometry | Place sound markers in the document. |
| 99 | Speed Cull | Menu Command | Improves rendering speeds. |
| 100 | Sphere | Geometry | Draw ellipsoids and spheres. |
| 101 | Spin | Menu Command & Modifier | Spin objects continuously. |
| 102 | Spot Light | Geometry | Place spot lights in the document. |

| # | Name | Type | Use the plug-in to… |
|---|---|---|---|
| 103 | Status | Idler | Calculate the status of the rendering process when a non-interactive renderer is used and display the results in the Help palette |
| 104 | Subdivision | Palette | Specify the type of internal geometries used to draw conics and how geometries drawn using conics or NURBs are triangulated. |
| 105 | Sun Direction | Modifier | Adjust the direction the sun light shines in. |
| 106 | Surface Area | Menu Command | Calculate the surface area of the objects in a selection or scene. |
| 107 | Take Picture | Modifier | Save a PICT image of the window contents at 72dpi. |
| 108 | Teleport | Modifier | Move the camera's view to the center of an object, or the point, clicked on. |
| 109 | Text Marker | Geometry | Place text markers in the document. |
| 110 | Textures | Palette | Import and manipulate a texture applied to an object and play movies as textures. |
| 111 | Timer | Menu Command | Calculate how often the screen is redrawn per second. |
| 112 | To Interactive | Menu Command | Automatically switch the application from non-interactive to interactive rendering. |
| 113 | Torus | Geometry | Draw torus geometries. |

| # | Name | Type | Use the plug-in to… |
|---|---|---|---|
| 114 | Triangulate | Modifier | Break an object or group up into its constituent triangles |
| 115 | Tripod | Palette | Change the document view. |
| 116 | Turbocharge | Menu Command | Speed up redraws by converting selected geometries or the entire document into QuickDraw 3D 1.5 tri-mesh geometries. |
| 117 | VR | Modifier | Pan and tilt the camera using control mechanisms similar to those found in QuickTime™ VR. |
| 118 | VRML 1.0 Format | Export | Export 3DMF files as VRML 1.0 files (Virtual Reality Markup Language). |
| 119 | VRML 1.0 Format | Import | Import files in VRML 1.0 format (Virtual Reality Markup Language). |
| 120 | Walkthrough | Modifier | Walk the camera through a scene. |
| 121 | Walls | Geometry | Create rooms other than those with 4 regular walls. |
| 122 | Windows & Doors | Palette & Geometry | Accurately position window and door objects in walls. |

# *Appendix L*

# *Command Key Table*

Command key shortcuts can be used to perform many actions. The following table lists those key combinations.

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| Action | L-2 |
| Command Key | L-2 |




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## COMMAND KEY TABLE

| Action | Command Key |
|---|---|
| **File Menu** | |
| New | Command N |
| Open | Command O |
| Close | Command W |
| Save | Command S |
| Print | Command P |
| Quit | Command Q |
| **Edit Menu** | |
| Undo | Command Z |
| Undo | F1 |
| Cut | Command X |
| Cut | F2 |
| Copy | Command C |
| Copy | F3 |
| Paste | Command V |
| Paste | F4 |
| Clear Whole Object | Backspace |
| Clear Whole Object | Delete |
| Select All | Command A |
| Duplicate | Command D |
| Group | Command G |
| Ungroup | Command U |
| **View Menu** | |
| New Window | Command K |
| Look At Selected | Command 1 |

| Action | Command Key |
|---|---|
| **View Menu continued...** | |
| Home View | Command H |
| Home View | Home |
| Custom (View) | Command 0 |
| Top (View) | Command 5 |
| Front (View) | Command 8 |
| Left (View) | Command 4 |
| Right (View) | Command 6 |
| Back (View) | Command 2 |
| Last View | Command 9 |
| Last View | End |
| **Options Menu** | |
| Edit Item | Command E |
| Lock | Command L |
| Autogrid | Command Y |
| Metric | Command M |
| Inches | Command I |
| Spin around Look At | Command T |
| **Plug-in Menu** | |
| Last Plug-in | Command * |
| **Help Menu** | |
| Online Manual | Help |
| **Others** | |
| Refresh | F5 |

# *Appendix M*

# *Glossary*



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#### 2D

A 2D object has measurements in only two dimensions. For example, an object that has width and height but no depth.

#### 3D

A 3D object has measurements in three dimensions.

#### 3DMF (3D Metafile)

The standard QuickDraw 3D file format for 3D models.

#### Active Window

The window in which the user is currently working.

#### Ambient Light

Light with no specific point of origin that shines equally from all directions.

#### Attribute

A characteristic of an object. For example, color, texture, or reflectivity.

#### Auto Save

A feature of the Librarian application that saves the contents of a library automatically whenever the data in the library changes, or at certain time intervals.

#### Axial Acceleration Factor

A value that determines the rate of increase in the distance per turn that the lathe template moves along the lathe axis.

#### Axial Speed Factor

A value that determines the initial distance per turn that the lathe template moves along the lathe axis.

#### Axis

A reference line in space that helps to define the position of geometric objects.

#### Axis of Rotation

A hypothetical line through the center of an object's bounding sphere around which the object is rotated.

#### Backface

The surface of an object which faces away from the camera and which, in a solid object, is hidden from view by the front face.

#### Background

The plane in a 3D World document upon which all background pictures appear to be superimposed.

#### Basic Geometry

The geometry of an object is said to be basic if it cannot be broken down into more simple shapes.

#### Bounding Frame/Rectangle/Sphere

An open structure rectangle or sphere that completely encloses an object or objects.

#### Camera Coordinates

The coordinate system relative to the view angle of the camera.

#### Checkbox

A standard Macintosh control that displays a setting either checked (on) or unchecked (off). Clicking a check box or its text reverses its setting.

#### Clipping Plane

Either of the two planes that are used to cut through the image and remove that part which is either in front of the front clipping plane, or behind the back clipping plane.

#### Constrain

To restrict an object. Object movement and scaling can be restricted to a particular axis.

#### Coordinate Systems

Any system of applying planar or spatial positions to objects.

#### Coordinate Values

A set of numbers used to define the position of an object with reference to a system of axes.

#### Crab

To move sideways perpendicular to the direction the camera is pointing.

#### Cross Section

A plane or surface formed by cutting across a solid object, usually perpendicular to its axis.

#### Depth

The distance away from the viewer.

#### Diffused Light

Light that radiates from all directions.

#### Directional Light

A light source that radiates parallel rays of light in a specific direction.

#### Drag And Drop

A technique for moving or manipulating items. Allows you to click on an item and drag it to a new position.

#### Dynamic Updates

Windows display changes as actions are performed, rather than when the action is complete.

#### Editing/Group Window

A window that displays the contents of a group as single items to facilitate modifying grouped items. Double-click a group to display the editing window.

#### Elevation

A view produced by a camera pointing in a direction perpendicular to the X, Y, or Z axes, as determined by the World Coordinate System.

#### Ellipse

A shape like a flattened circle or sphere.

#### Extrude

To stretch a shape in one direction.

#### Foreground

The plane in a 3D World document which all objects appear to be behind.

#### Front Face

The side of an object directed towards the camera.

#### Geometry

A shape.

#### Global Lights

A checkbox in the 3D World Preferences dialog that allows the user to specify whether adjusting controls in the Lights palette affects the entire document or just the view in the current window.

#### Grid

A network of lines displayed in a 3D World document as a frame of reference for positioning objects.

#### Group

A set of collected objects which can be moved or manipulated as a single item.

#### Handle

A square or cube displayed at the points where the lines of a bounding frame intersect. Used to manipulate an object.

#### Hardware Renderer

An accessory for the computer used to accelerate the creation of an image. It may also allow you to use additional features within the application.

#### Helix

A spiral which winds outwards rather then upwards.

**Home View**

A standard 3D World view displayed when a new file is opened.

**Interactive Rendering**

Rendering fast enough to allow users to receive instant feedback from their actions.

**Lathe**

A 3D World tool used to produce an object by turning a template around an axis.

**Lathe Axis**

The user defined axis around which a lathe template is turned to produce a lathed object.

**Lathe Template**

The user defined shape which is turned around the lathe axis to produce a lathed object.

**Librarian**

An application included with 3D World that allows for easy storing and retrieving of data.

**Library**

A file created by the 3D World Librarian application.

**Light Marker**

A type of 3D World object which shows the position of spot/point lights, and the orientation of spot lights.

**Look At Selected**

A view option that allows you to direct a camera to create a view which centers on a selected object.

**Marker (Text/Sound)**

A 2D object which has a fixed position in 3D space, but always displays perpendicular to the camera.

**Marquee**

The rectangle created when you drag diagonally to select an object or group of objects.

**Named View**

A user defined view that is saved under a specific name.

**Object Coordinate System**

The coordinate system as defined by a selected object.

**Origin**

The point the X, Y and Z axes intersect (position 0,0,0).

**Original Geometry**

The shape of an object when it is first drawn.

**Orthographic**

A style of view that displays parallel lines as parallel, as opposed to a perspective view in which parallel lines, if extended, would converge to the vanishing point.

**Pan**

To turn a camera left or right on a fixed axis.

**Perspective**

A type of view that displays parallel lines in such a way that if extended, they would converge at some point. This creates an illusion of distance or depth.

**PICT**

A Macintosh image file format.

**Plane**

A hypothetical 2D construct that may exist at any orientation in space.

**Plug-In**

A programming architecture that allows features or tools to be easily added without changing the original code of an application.

**Polygon**

A planar object bounded by three or more straight sides that meet in pairs in the same number of vertices, and do not intersect other than at these vertices.

### Preferences

Settings or options specified in the Preferences dialog and saved in the application's Preferences file in the System folder.

### Pyramid

A solid object with a polygonal base and triangular sides that meet at a common vertex.

### QuickDraw 3D

A graphics library developed by Apple Computer, Inc. that can be used to create, render and interact with models of 3D objects. Also allows you to read and write 3D data.

### Radial Acceleration Factor

A value that determines the rate of increase in the distance per turn that a lathe template moves away from or towards the lathe axis as an object is lathed.

### Radial Speed Factor

A value that determines the initial distance per turn that a lathe template moves away from or towards the lathe axis as an object is lathed.

### Radius

Any straight line from the center to the periphery of a circle or sphere.

### Reflective Color

The color displayed on a surface that reflects sun or spot/point lights.

### Reflectivity

The degree to which a surface is able to reflect light.

### Render

To create a 2D image on the screen of a 3D model.

### Scrapbook

An application provided by Apple Computer, Inc. that allows users to display, cut, copy and paste data.

### Select

To choose an object or objects that will be affected by the next action, or to choose a location where the next action will take place. To select an object in 3D World, click on it or drag out a rectangle with the Marquee tool.

### Shading

The graded areas of color applied to an object to give the illusion of depth and lighting.

### Shadow

The projection of an object on the document grid, used to facilitate the positioning of objects. Shadows are not affected by light sources.

### Sharpness

The hardness of the edge of a beam of light.

### Shininess

The degree of directional light an object is able to reflect.

### Snapping Grid

An invisible grid in a 3D World document on which all parts defining the object and its position must lie. All dimensions will be a multiple of the set grid distance.

### Solid Fill

Objects are drawn with surfaces rather than as wire frame shapes.

### Sound Icon

An icon depicting a speaker that represents a sound file or sound data.

### Spiral

A twisted or winding shape; a helix.

### Spread

The range of a hypothetical cone directing a beam of light.

### Sun Light

Directional light from overhead.

#### Surface

The exterior face of an object.

#### Texture

A PICT image applied to a surface to give the impression that it is a solid object of a different material.

#### Tilt

To rotate an object away from its vertical axis.

#### Transparency

The degree to which an object will allow other objects to be seen through it.

#### Twist

To rotate an object around its Y axis.

#### Ungroup

To remove a command that defines a set of collected objects as a single item.

#### Unlock

To remove a command which fixes an object so that it cannot be moved or modified.

#### Vanishing Point

The point to which parallel lines appear to converge in a perspective view.

#### Vertex

A point at which two or more lines intersect.

#### View Definition

The camera position, height and angle that determines how a view is displayed in a window.

#### Wire Frame

An object is displayed only with lines, not surfaces.

#### World Coordinate System

The coordinate system defined in the 3D World application and displayed by the grid.

#### X Axis

A reference axis which is depicted as a red line along which the X coordinate is measured.

#### Y Axis

A reference axis which is depicted as a green line along which the Y coordinate is measured.

#### Z Axis

A reference axis which is depicted as a blue line along which the Z coordinate is measured.

#### Z Dimension

A measurement along the Z axis.

#### Zoom

To increase or decrease the apparent magnification of an image.

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